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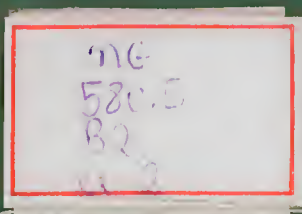
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Parque Zoobotânico - Av. Magalhães Barata, 376, São Braz
Campus de Pesquisa - Av. Perimetral, Guamá
Caixa Postal: 399. Telex: (091) 1419. Telefones: Parque,(091) 224-9233. Fax (091) 241-7384
Campus, (091) 228-2341 e 228-2162.
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ASSOCIAÇÃO RIZÓBIO-LEGUMINOSAS NA AMAZÔNIA[1]

Fátima M.S. Moreira[2]
Marlene F. da Silva[3]

RESUMO - Grande parte das espécies de leguminosas tropicais ainda carece de informações sobre sua capacidade de nodular, isto é, de se associar simbioticamente a bactérias fixadoras de nitrogênio dos gêneros Rhizobium, Bradyrhizobium, Azorhizobium *e* Sinorhizobium. *Sendo assim, foi realizada uma pesquisa extensiva sobre a ocorrência de nodulação em leguminosas, através do projeto "Levantamento da capacidade de nodulação e/ou fixação de nitrogênio, em espécies florestais da Região Amazônica" no período compreendido entre junho/1984 e junho/1987. Os resultados obtidos foram, então, divididos, de acordo com as áreas pesquisadas, em 4 comunicações que serão divulgadas sucessivamente. Nesta primeira comunicação são apresentados os resultados relativos às coletas realizadas no Município de Manaus, incluindo a Reserva Ducke, e no Município de Manacapuru. Das 96 espécies e 48 gêneros coletados nesta etapa, 57 espécies e 8 gêneros não possuíam referências anteriores na literatura sobre a capacidade de nodular. Foram encontrados nódulos em espécies dos gêneros* Campsiandra, Etaballia *e* Abarema. *Por outro lado, os gêneros* Aldina, Bocoa, Lecointea, Taralea *e* Marmoroxylon *parecem incapazes de nodular. A maior parte das estirpes de bactérias isoladas dos nódulos tem características típicas do gênero* Bradyrhizobium.

PALAVRAS-CHAVE: Leguminosas - Rizóbio, Leguminosas da Amazônia, Associação Rizóbio-Leguminosas

ABSTRACT - A great part of tropical leguminous species has yet no informations about nodulation capability, e.a., capability of simbiotic association with nitrogen fixing bacteria belonging to the genera Rhizobium, Bradyrhizobium, Azorhizobium *and* Sinorhizobium. *Therefore, an extensive research on nodulation occurrence in leguminous species of the Amazon region was performed by the project "Survey on nodulation capability and/or nitrogen fixation in forest species of Amazon region" during the period june/1984-june/*

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[1] Projeto 54/84/0294/00, financiado pelo Convênio FINEP/INPA/CODEAMA

[2] Coordenação de Pesquisas em Ciências Agronômicas-CPCA/INPA

[3] Coordenação de Pesquisas em Botânica-CPBO/INPA; Centro de Ensino e Pesquisas Florestais-CEPEP/UTAM

1987. Results of this project are divided in 4 phases according to the areas of collection. In this paper, results of the phase 1, related to collection on Municipios of Manaus, including Reserva Florestal Ducke and Manacapuru are introduced. From 96 species and 48 genera collected in this phase, 57 species and 8 genera had no previous informations on the literature, about nodulation capability. Nodules were found in species of the genera: Campsiandra, Etaballia *and* Abarema. *By contrary, the genera* Aldina, Bocoa, Lecointea, Taralea *and* Marmoroxylon *seems not able to nodulate. The majority of bacteria isolated from nodules have typical cultural charactheristics of the genus* Bradyrhizobium.

KEY WORDS: Leguminosae - Rhizobia, Leguminosae of the Amazon, Association Rhizobia-Leguminosae

INTRODUÇÃO

Na flora amazônica a família Leguminosae tem grande diversidade em espécies e é uma das mais abundantes em número de indivíduos (Ducke 1949, 1959; Black et al. 1950; Rodrigues 1961; Rodrigues 1967 a e b; Klinge & Rodrigues 1971; Prance et al. 1976). Ducke (1949) reportou 867 espécies distribuídas em 118 gêneros de Leguminosae na Amazônia brasileira. Desde o trabalho de Ducke (1949) novas espécies e gêneros têm sido descritos (Barneby & Grimes 1984; Cowan 1966, 1967, 1975; Forero 1972; Hopkins 1986; Lee & Langenheim 1975; Mesquita & Silva 1984; Rodrigues 1974, 1975; Rodrigues & Lima 1989; Rodrigues & Matos 1980; Silva 1981,1986; Silva & Graham 1980, e outros) aumentando significativamente aqueles números. Em uma "check-list" preliminar elaborada com base nas coleções dos principais herbários da região (INPA, MG e EMBRAPA/CPATU (IAN), antigo IPEAN) e algumas revisões taxonômicas modernas, Silva et al. (1989) encontraram um total de 146 gêneros, 1.241 espécies e 310 táxons infra-específicos nas 3 subfamílias consideradas (Caesalpinioideae, 48 gêneros, 475 espécies, 22 subespécies e 175 variedades; Mimosoideae, 23 gêneros, 288 espécies, 3 subespécies e 18 variedades; Papilionoideae, 75 gêneros, 478 espécies, 2 subespécies, 84 variedades e 6 formas).

Bactérias aeróbicas fixadoras de nitrogênio dos gêneros *Rhizobium, Bradyrhizobium, Azorhizobium* e *Sinorhizobium* vivem saprofiticamente no solo ou em simbiose com várias espécies leguminosas, formando estruturas nodulares em suas raízes ou, excepcionalmente, no caule como em *Sesbania rostrata* (Dreyfus et al. 1988).

A fixação biológica de nitrogênio é um proeesso que já vem sendo explorado eeonomieamente no eultivo de espéeies agrícolas importantes eomo a soja, o feijão e a ervilha, entre outros, em substituição aos onerosos adubos nitrogenados, obtidos através de proecssos industriais.

O potencial de utilização de várias espécies de leguminosas nativas da Amazônia eomo alimento, madeira, adubação verde, produtos químieos, etc., vem sendo destaeado por diversos autores (Loureiro et al. 1979; National... 1979; Arkool 1984a,b; Morcira & Franeo 1992) e a fixação biológiea de nitrogênio pode desempenhar papel importante na exploração eeonômiea dessas espéeies.

Como a assoeiação simbiótiea de baetérias fixadoras de nitrogênio eom muitas espéeies tropieais ainda era deseonhecida (Allen & Allen 1981), foi realizado um levantamento extensivo sobre a eapaeidade de nodulação de espéeies nativas da Amazônia durante o período de junho/1984 e junho/1987.

Nestc trabalho são forneeidas informações sobre a capaeidade de nodular de espéeies encontradas no Estado do Amazonas em áreas dos Municípios de Manaus, ineluindo a Reserva Florestal Ducke, na BR 174, e de Manacapuru.

MATERIAL E MÉTODOS

Foram realizadas várias excursões para eoleta de material durante o período de junho/1984 e junho/1987, no Munieípio de Manaus, inelusive na Reserva Ducke e uma exeursão ao Distrito de Caviana, no Munieípio de Manacapuru, de 12 a 27 de março de 1985.

Espéeimes de leguminosas eom diferentes hábitos de ereseimento, preferentemente com flores e/ou frutos, foram eoletadas ao longo das margens de rios, estradas ou em picadas abertas dentro da mata. Para prevenir o ataque de fungos, as amostras, em geral, foram embebidas em áleool eomereial e eoloeadas dentro de sacos plásticos e feehados. Em Manaus, elas foram prensadas, eoloeadas na estufa para seear e posteriormente foram identifieadas sendo, em muitos casos, incorporadas ao Herbário do INPA.

Em plantas adultas foram proeurados nódulos seguindo-se as raízes laterais a partir do troneo até suas ramificações mais finas. Quando havia mudas próximo à planta matriz seu sistema radicular era retirado intacto do solo eom auxilio de um enxadeco. Em ambos os casos, eavar o solo foi uma

capacidade de nodular. Foram encontrados nódulos em espécies dos gêneros *Campsiandra, Etaballia* e *Abarema*. Os gêneros *Aldina, Bocoa, Lecointea, Marmaroxylon* e *Taralea* parecem incapazes de nodular, principalmente os gêneros *Lecointea* e *Taralea* que também não nodularam em condições de viveiro.

Cassia leiandra Benth. não nodulou mesmo quando cultivada em viveiro. Este resultado é conflitante com a observação feita anteriormente por Norris (1969), sobre ocorrência de nodulação nesta espécie, na região de Manaus.

Sclerolobium, Hymenolobium, Pterocarpus, Derris e *Calliandra*, geralmente reportados como nodulíferos por outros autores (Faria et al., 1989) foram encontrados sem nódulos, nas áreas pesquisadas. Porém , *Andira micrantha* Ducke e *Platymiscium duckei* Huber, também encontradas sem nódulos no campo, nodularam quando cultivadas em viveiro. Estes exemplos indicam a necessidade de não se considerar somente dados de campo como prova da incapacidade de nodular de uma espécie. No campo, condições de equilíbrio na nutrição de nitrogênio, ausência de estirpes de rizóbio específicas e outros fatores limitantes, podem impedir o estabelecimento e o desenvolvimento da simbiose em uma espécie nodulífera. Em viveiro, estes fatores podem ser controlados para que a nodulação seja induzida, de modo que, se a espécie é capaz de nodular, ela terá condições adequadas de expressar esta característica. No caso de *Pterocarpus*, que também não nodulou em viveiro, provavelmente, o período de crescimento (5 meses) não foi suficiente para a indução da formação de nódulos. Faria (com. pessoal) relata que algumas espécies só começam a nodular em viveiro, 7 meses após a germinação.

O cultivo de espécies em viveiro no levantamento da capacidade de nodular, em leguminosas, também é útil no caso de indivíduos cujo sistema radicular é de difícil acesso como nas matas muito densas e/ou em condições alagadas, por exemplo. Outro objetivo do estudo na nodulação das espécies em viveiro é a possibilidade de isolamento de rizóbio nativo de diferentes solos da região amazônica.

A autenticidade dos nódulos encontrados como estruturas induzidas por bactérias fixadoras de N2 foi confirmada pela medida da atividade de nitrogenase (enzima responsável pela fixação de N2) através da técnica de redução do acetileno (ARA). Em todas as espécies noduladas foram encontrados nódulos com atividades da nitrogenase (ARA), positiva (+).

Um nódulo de aproximadamente 10cm, e outros semelhantes, foram encontrados em *Swartzia schomburgkii* Benth. e a ARA positiva confirmou a autenticidade destas estruturas.

Machaerium leiophyllum (DC). Benth. var cristacastrense (Mart. ex Benth.) Rudd., *Tachigalia plumbea* Ducke e Swartzia ulei Harms também foram encontradas nas áreas estudadas, mas, suas capacidades de nodulação não puderam ser pesquisadas porque seus sistemas radiculares estavam submersos.

Outros 20 indivíduos coletados não puderam ser identificados a nível de espécie. Esses indivíduos foram classificados nos gêneros: *Sclerolobium, Tachigalia, Cassia, Bauhinia, Pentaclethra, Acacia, Inga, Pithecellobium, Diplotropis, Platymiscium, Dalbergia* e *Dioclea.*

Várias estirpes com características típicas de rizóbio, a maior parte com características do gênero *Bradyrhizobium*, foram isoladas dos nódulos coletados. A caracterização morfológica, bioquímica, fisiológica e genética destas estirpes se encontra em andamento e estes resultados serão divulgados em trabalhos posteriores.

Tabela 1. Ocorrência de nodulação em leguminosas da Amazônia, nos Municípios de Manaus (MAO), incluindo a Reserva Florestal Ducke (RFD) e Manacapurú (Mc).

TAXON	Col. FMSM Herb.INPA ***	Número de indivíduos observados	Local de Coleta	Hábito da Planta*	Nodulação Campo/	Viveiro **	Referências anteriores sobre capacidade de nodular
CAESALPINIOIDEAE							
Caesalpinieae							
Caesalpinia ferrea Mart. ex Tul.	252	12	MAO	M	nd	-	Faria et al. 1984
C. pulcherrima (L.) Sw.	254	12	MAO	M	nd	-	Allen & Allen 1981
Dimorphandra parviflora Spruce ex Benth.	239/133625	2	RFD	A	-	nd	Magalhães 1986
Campsiandra comosa (Bth.) Cowan var. laurifolia (Bth.) Cowan	10/133836	4	Mc, MAO	A,M	+	+	-
Sclerolobium chrysophyllum Poepp. & Endl.	157/151904	1	RFD	A	-	-	-
Vouacapoua pallidior Ducke	153	3	RFD	A	+	nd	Magalhães & Fernandes 1984
Cassieae							
Cassia leiandra Bth.	235/133623	12	Mc, MAO	M	nd	-	Allen & Allen 1981
Chamaecrista nictitans (L.) Moench. ssp. *disadena* (Steud.) Irwin & Barneby	51/133854	1	Mc	E	+	nd	Allen & Allen 1981
Dialium guianensis (Aubl.) Sandw.	37	1	Mc	A	-	nd	Magalhães et al. 1982; Faria et al. 1984
Senna quinquangulata (Rich.) Irwin & Barneby	215/133609	6	MAO	E,M	-	-	-
S. siamea (Lam.) Irwin & Barneby	227/133617	2	MAO	M	nd	-	Allen & Allen 1981
S. silvestris (Vel.) Irwin & Barneby	60/133860	2	Mc	A,M	-	nd	Faria et al. 1987
Detarieae							
Cynometra bauhiniifolia Bth.	20/133839	31	Mc, MAO	A,M	-	-	-
Copaifera multijuga Hayne	141/133870	22	RFD	A,M	-	-	Magalhães 1986
Crudia amazonica Spr. ex Bth.	27/124720	16	Mc	A,M	-	nd	-
C. pubescens Spr. ex Bth.	18/133838	20	Mc	A,M	-	-	-
Peltogyne paniculata Bth.	224	7	RFD	A,M	-	-	Magalhães et al. 1982
P. catingae Ducke ssp. *glabra* (W. Rodr.) M.F. da Silva	173	1	RFD	A	-	nd	-
P. excelsa Ducke	178	1	RFD	A	-	nd	-
P. venosa Bth.	56	2	Mc	A	-	nd	Magalhães 1986
Amherstieae							
Macrolobium limbatum Spruce ex Bth.	147	2	RFD	A	-	nd	-
M. microcalyx Ducke	221	1	RFD	A	-	nd	-
M. acaciifolium Bth.	24/124719	25	Mc, MAO	A	-	-	Faria et al. 1987
M. angustifolium (Bth.) Cowan	46/133849	1	Mc	A	-	nd	-

(*) A = árvore; Ab = arbusto; C = cipó; E = erva; J = indivíduo jovem; M = muda
(**) + nódulos presentes; - = ausência de nódulos; nd = nodulação não verificada
(***) col = coleção
Herb = herbario

TAXON	Col. FMSM Herb.INPA ***	Número de indivíduos observados	Local de Coleta	Hábito da Planta*	Nodulação Campo/ Viveiro **	Referências anteriores sobre capacidade de nodular
PAPILIONOIDEAE						
Swartzieae						
Aldina latifolia Spr. ex Bth.	-	2	MAO	A	- nd	-
A. heterophylla Spr. ex Bth.	-	2	MAO	A	- nd	-
Bocoa viridifolia (Ducke) Cowan	165	2	RFD	A	- nd	-
Lecointea amazonica Ducke	09	12	Mc	A;M	- -	-
Swartzia reticulata Ducke	149	1	RFD	A	- nd	-
S. laevicarpa Amsh.	57/133858	1	Mc	A	- nd	-
S. sericea Vog.	36/133846	1	Mc	M	- nd	-
S. schomburgkii Bth.	146	2	RFD	A	+ nd	-
S. ulei Harms.	197/133593	3	RFD	A;M	- -	-
S. ingifolia Ducke	203/133599	3	RFD	A;J	- nd	-
S. cuspidata Bth.	148	3	RFD	A	- nd	-
S. polyphylla DC.	36/133845	1	Mc	M	+ nd	-
Sophoreae						
Acosmium nitens (Vog.) Yacovlev	28/133841	1	Mc	A	- nd	-
Diplotropis purpura (Rich.) Amsh.	170	1	RFD	A	+ nd	Magalhães et al. 1982
Ormosia macrocalyx Ducke	48/133851	18	Mc	A;M	+ +	-
O. smithii Rudd.	204/133600	1	RFD	A	- nd	-
O. discolor Spr. ex Bth.	47/133850	1	Mc	A	- nd	-
Dipterygeae						
Dipteryx odorata (Aubl.) Willd.	207/133603	1	RFD	A	- nd	Várias
D. magnifica Ducke	237/133624	1	RFD	A	- nd	-
Taralea oppositifolia Spr. ex Bth.	175	1	RFD	A	- nd	-
Aeschynomeneae						
Aeschynomene rudis Bth.	03/133833	1	Mc	Ab	+ nd	Allen & Allen 1981; Faria et al. 1984
Dalbergieae						
Andira micrantha Ducke	156/133872	10	RFD	A;M	- +	-
A. surinamensis (Bth.) Splitg.	151/133871	1	RFD	A	- nd	Allen & Allen 1981
A. unifoliolata Ducke	166/133875	1	RFD	A	- nd	Sylvester-Bradley et al. 1980
Dalbergia inundata Bth	23/124717	2	Mc; MAO	C	+ nd	-
D. riparia (Mart.) Bth.	54/133857	9	Mc	C;M	+ +	-
Etaballia dubia Rudd.	31/133843	3	Mc	A	+ nd	-
Hymenolobium heterocarpum Ducke	158/133873	1	RFD	A	- nd	-
H. sericeum Ducke	151	1	RFD	A	- nd	-
Machaerium froesii Rudd.	15	1	Mc	A	+ nd	Matos.

TAXON	Col. FMSM Herb.INPA ***	Número de indivíduos observados	Local de Coleta	Hábito da Planta*	Nodulação Campo/ Viveiro **		Referências anteriores sobre capacidade de nodular
M. inundatum (Mart. ex Bth.) Ducke	23-A/124718	25	Me	C	nd	+	Magalhães 1986
Platymiscium duckei Huber	08/139629	14	Me;MAO;RFD	A;M	-	+	-
Pterocarpus amazonicus Huber	26/124721	26	Me	A;M	-	-	-
P. amazonum (Mart. ex Bth.) Amsh.	163/133874	2	Me; RFD	A	-	nd	-
Vatairea guianensis Aubl.	19/124716	26	Me	A;M	-	-	Faria et al. 1987
Milletieae							
Derris longifolia Bth.	21/133840	1	Me	C	-	nd	-
Phaseoleae							
Clitoria javitensis (H.B.K.) Bth.	448	1	MAO	C	+	nd	-
Dioclea macrocarpa Hub.	449	1	MAO	C	+	nd	-
MIMOSOIDEAE							
Parkieae							
Parkia discolor Bth.	189/133586	24	MAO	A;M	-	-	-
P. multijuga Bth.	201/133597	2	RFD	A	-	nd	Magalhães et al. 1982; Magalhães 1986
P. oppositifolia Bth.	225/133615	27	MAO;RFD	A;M	-	-	-
P. pendula Bth. ex Walp.	210/133604	1	RFD	A	-	nd	Vários
Pentaclethra macroloba (Willd.) Kunth.	226/133616	13	MAO	A;M	+	+	Vários
Mimoseae							
Adenanthera pavonina L.	230/133618	12	MAO	M	nd	-	-
A. peregrina (L.) Bth.	231/133619	6	MAO	M	nd	+	vários
Entada polyphylla Bth.	02	1	Me	E	+	nd	Campelo 1976
Mimosa pigra L.	194/133690	1	MAO	Ab	+	nd	Sylvester-Bradley et al 1980
M. polystachya Kunth.	186/133597	4	MAO	M	nd	+	-
Stryphnodendron pulcherrimum (Willd.) Hochr.	202/133598	3	Me; RFD	A	-	nd	Faria et al. 1984
S. microstachyum Poepp. & Endl.	187/133584	6	MAO	M	nd	+	-
Ingeae							
Calliandra tenuiflora Bth.	160	2	RFD	A	-	nd	-
Cedrelinga catenaeformis Ducke	140	1	RFD	A	+	nd	Magalhães et al. 1982
Enterolobium schomburgkii Bth.	242	2	RFD	A	-	nd	Magalhães et al. 1982
Inga capitata Desv.	232/133620	6	MAO	M	nd	+	-
Inga edulis Mart.	41	1	Me	A	+	nd	vários
I. ingoides (Rich.) Willd.	07	1	Me	A	+	nd	Allen & Allen 1981
I. nobilis Willd.	05/133835	1	Me	A	+	nd	-
I. pamreusis Spr. ex Bth.	200/133596	1	RFD	A	-	nd	-

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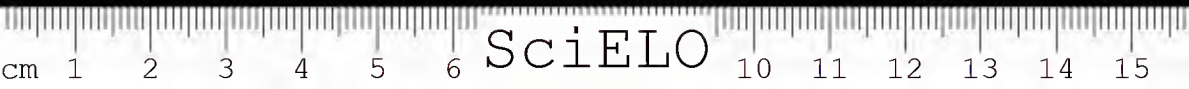
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STUDIES IN ANNONACEAE. XVI. A TAXONOMIC REVISION OF *DUGUETIA* A. F. C. P. DE SAINT-HILAIRE SECT. *DUGUETIA* (ANNONACEAE) IN EASTERN BRAZIL

Ping He[1]
P. J. M. Maas[2]

ABSTRACT - This paper contains a taxonomic revision of the species of Duguetia *Sect.* Duguetia *that occur in Brazil E of 50 WL. Three species and one variety recognized in the earlier treatment af the genus by Fries are now put into synonymy. The present study is part of the monographic stndy of the whole genus currently under way, ta be published in Flara Neotropica.*

KEY WORDS: Annonaceae, *Dugnetia*, Taxonomic revision

RESUMO - Este trabalho é uma revisão taxanômica das espécies do gênero Duguetia *Secção* Duguetia, *ocorrentes no Brasil a Este de 50° WL. Três espécies e uma variedade, anteriormente reconhecidas na tratamento da gênero por Fries, são agora colocadas em sinonímia. Este estudo faz parte duma obra monográfica da gênero inteiro atualmente em andamento e a ser publicada na Flora Neotrópica.*

PALAVRAS-CHAVE: Annonaceae, Duguetia

INTRODUCTION

Being kindly invited to spend a year at the Herbarium of the Department of Plant Eeology and Evolutionary Biology, University of Utreeht, the first author has been able to eoncentrate his attention on the taxonomy of the eastern Brazilian species of Sect. *Duguetia* of the genus *Duguetia* between February and December, 1990.

[1] Department of Biology, Southwest China Teachers University, Beibei, Chongqing, Sichuan, China

[2] Department of Plant Ecology and Evolutionary Biology, Herbarium Division, University of Utrecht, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands

TAXONOMIC HISTORY

The genus *Duguetia* was established by Saint-Hilaire (1824) in Flora Brasiliae Meridionalis with the type species *D. lanceolata* A. F. C. P. de Saint-Hilaire. The genus was named after Jacobus Joseph Duguet, a french activist and author of "Ouvrage des six jours" (1731). Martius (1841) enlarged the genus with 7 new species. Afterwards, Baillon (1868) regarded *Duguetia* as a synonym of *Aberemoa* Aublet with *Aberemoa guianensis* as type. *Aberemoa guianensis*, however, belongs to *Guatteria* Ruiz et Pavón. Thus the generic name of *Duguetia* was used again by Prantl (1891). In the following years many new species were described.

Duguetia occurs throughout the Neotropics and is characterized by the the combination of a pseudosyncarpous fruit and stellate to entire scales and/ or stellate hairs.

In his revision of *Duguetia* in 1934, R. E. Fries grouped the 67 species then known in 13 sections. A new section, *D.* Sect. *Xylopipetalum*, was added to accomodate a new species (1937). The section *Duguetia* ("*Eu-Duguetia*") was by far the largest with 25 species. *D. caudata* was described by Fries in 1937 and added as the 26th member of the section.

Several of Fries's sections are based on unique character states, and appear quite natural-looking. Whether or not these are truly natural groups remains to be settled yet. At any rate, these sections are easily recognisable. *D.* Sect. *Duguetia*, on the other hand, is not so easily recognized as such. It is defined rather by a combination of character states, viz., entire scales on all floral parts, small bracts, (nearly) free calyx lobes, and two whorls of petals of about the same size.

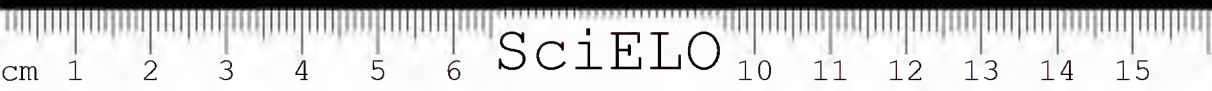
In the present study, those species of *D.* Sect. *Duguetia* are treated that are found in the eastern part of Brazil, i.e., east of 50° WL (Table 1, Figures 1-3). Some species are restricted to small areas along the east coast (Rio de Janeiro, São Paulo, Bahia). The distribution patterns of others, on the contrary, are extended far more toward the north-west, (up to Colombia, Venezuela, and Suriname), west (Matto Grosso), or south-west (as far as Paraguay or Bolivia).

Among the species of this section, *D. furfuracea* (including *D. hemmendorffii* and *D. jonasiana*) is the most widely spread, ranging from Brazil (Mato Grosso, Paraná, São Paulo, Bahia, Goiás to Ceará) to Paraguay

and Bolivia. Besides, it is the most variable species showing dynamic diversity of infra-specific morphological and ecological variations. It is found in dense secondary forest, as well as in dry and open vegetations (cerrado).

Apart from some species in *Annona*, the last-mentioned vegetation type is very unusual for annonaceous species, which mostly occur in primary or secondary forest. However, within Sect. *Duguetia* there are some notable exceptions, too. *D. dicholepidota* and *D. moricandiana*, both highly similar to *D. furfuracea*, are found in caatingas and restingas of Bahia. Four other species, viz., *D. lanceolata*, *D. riedeliana*, *D. microphylla*, and *D. salicifolia* are also regarded as closely related. They occur in cerrados, or in semideciduous or montane forest along the east coast of Brazil. *D. glabriuscula*, known from Mato Grosso and Bolivia, is found in comparable cerrado vegetation. It is so similar to *D. lanceolata*, that we decided to include *D. glabriuscula* in the present treatment, notwithstanding its slightly more westerly distribution.

Three other species, viz., *D. echinophora*, *D. marcgraviana* (including *D. brevipedunculata*), and *D. lepidota*, show a rather high resemblance to *D. furfuracea*, especially in their leaf indument. Although their main area is more in the north-west (map 4), they are found as far east as Maranhão or Piauí, and are therefore included in this study. Their habitat is primary or secondary forest (*D. echinophora*, *D. lepidota*), or wet savannas and gallery forest (*D. marcgraviana*).

Of the species of Sect. *Duguetia* not included in the present treatment, two show clear links to eastern Brazilian species, and therefore should be mentioned here. *D. lucida* is closely related to *D. lanceolata*, but occurs in Trinidad, Tobago, Venezuela, Guyana, and the Brazilian states Acre and Roraima. *D. surinamensis* comes morphologically close to *D. echinophora*, *D. lepidota*, and *D. marcgraviana*, but occurs from Colombia to Pará, as far south as Goias. *D. quitarensis* should also be mentioned. It is found from Guyana to E Peru and Bolivia, but may occur as far east as Maranhão. The species is, however, morphologically highly variable and represents perhaps a complex of species. For this reason, it has also been omitted from the present study. Although *D. lucida*, *D. surinamensis* and *D. quitarensis* are not treated in full, they are discussed under the descriptions of the allied species to facilitate their identification.

MATERIAL AND METHODS

For this study, material of the following herbaria was investigated: A, AAU, B, BM, BR, C, CEPEC, COL, E, ECON, F, G, GB, GH, GUA, HBG, IAN, INPA, K, LE, M, MICH, MG, MO, NA, NY, OXF, P, R, RB, S, SP, U, UC, US, VEN, W, WIS, and Z.

For a better understanding of the interspecific variation, material from the whole area of a species was studied. Under "Specimens examined", however, only Brazilian material is cited.

All quantitative data are based on mature material. Measurements were mostly taken from many specimens.

The terminology used in the descriptions is mainly based on Radford et al. (1974) and Hickey (1979). Some terms need some explanation.

Indument

Within *Duguetia*, the indument and the structure of the individual trichomes is important for the circumscription and identification of the species. Basically, the trichomes can be classified into two types: scales and stellate hairs.

In this study, scales with free rays over less than 1/3 of their length are referred to as "entire scales". "Stellate scales" applies to trichomes with rays free over 1/3 - 2/3 of their length. The term "stellate hairs" has been reserved for trichomes with at least 2/3 of rays free (Figure 3).

When stellate hairs are present, they may have a slightly different morphology on different plant parts.:

a. Appressed: the rays of the stellate hairs remain close to the plant surface (may be found on both upper and lower side of the leaves).

b. Erect: the rays of the stellate hairs are straight, more or less perpendicular to the plant surface (may be found on adaxial side of lamina, on ovary and stigma).

c. Curviform: the rays of the hairs are irregularly curved (found on inner side of bracts, sepals, and petals of all species, and sometimes on stigmas as well).

The density of the indument varies considerably, between species and with age. The following categories are used:

- "sparse": less than 5 trichomes per mm^2;
- "rather dense": 5-10 trichomes per mm^2;
- "dense": more than 10 trichomes per mm^2. In this category, the trichomes often touch each other.

Venation patterns

Venation patterns may change more or less during development of a leaf. Therefore, only mature leaves were described. Besides, many leaves have different venation patterns in the lower, middle, and upper part of the leaf (Klucking 1986). In this paper, only the middle part of the leaf was taken into consideration.

SYSTEMATIC TREATMENT

Duguetia A. F. C. P. de Saint-Hilaire Sect. *Duguetia* R. E. Fries, Acta Horti Berg. 12(1): 32. 1934 ("Eu-Duguetia"); R. E. Fries in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 17 a II: 55. 1959.

Shrubs to trees. Twigs striate or ribbed, lenticellate, sparsely to densely covered with yellowish fimbriate to stellate scales, becoming glabrous with age. Leaves petiolate. Lamina elliptic, ovate, to obovate, or narrowly so, chartaceous to coriaceous, base acute to obtuse, apex acute, acuminate to rounded, upper side glabrous to rather densely covered with whitish or yellowish, 5-18(-20)-rayed, appressed or erect stellate hairs, becoming glabrous with age, lower side sparsely to densely covered with fimbriate to stellate scales, primary vein impressed on the upper side, venation camptodromous, secondary veins uniformly or abruptly curved, raised on both sides, between 5-22 on either side of the primary vein, angles with primary veins between 45°-90°, intercostal area distinct, distance between the middle of closure and margin 1-10 mm, tertiary veins (slightly) raised on the upper side, slightly raised to flat on the lower side, forming (1-16 more or less irregular nets.

Inflorescence leaf-opposed, pseudo-terminal or rarely supra-axillary, simple, 1-3-flowered, or ramose, (1-)3-16-flowered rhipidia, subsessile or on

the top of a 2-5 mm long, ligneous, rudimentary twig. Pedicels straight or recurved, to 25 mm long, to 35 mm long in fruit. Bract(s) 1-2 to the pedicel, small, cadueous, the lower bract below the articulation, amplectant, mostly broadly to depressed ovate-triangular, the upper bract amplectant below the articulation, broadly to depressed ovate-triangular. Indument of inflorescence (including fruits) consisting of stellate scales and/or stellate hairs; pedicels, outer side of bracts and sepals rather densely to densely covered with stellate scales, inner side of bracts, sepals, and petals rather densely to densely covered with stellate hairs to glabrous, fruit sparsely to densely covered with stellate hairs and scales or rarely glabrous.

Flower buds broadly ovoid to subglobose, with or without 3 ribs, apex acute to obtuse or mucronate, to 10(-12) mm long. Flowers green to cream, yellow to red (-purple), usually pink to dark red at inner base (in vivo). Sepals connate at the base, ovate-triangular to very broadly ovate-triangular, much shorter than the petals. Outer and inner petals ovate to obovate, apex acute to obtuse, sometimes mucronate, to 30(-45) mm long. Torus depressed to very depressed ovoid-ellipsoid, apex concave. Stamens between 60-300, apical prolongation of connective shallowly to very shallowly conical, puberulous to glabrous. Carpels between 40-380(-480), glabrous to densely covered with erect stellate hairs, style terete, glabrous to densely covered with stellate hairs.

Fruiting receptacle ellipsoid, obovoid to subglobose, 10-35 mm long, 5-25 mm in diam. Fruit pseudosyncarpous, rarely syncarpous, green, brown to red (in vivo), ovoid to transversely broadly ellipsoid to spheroid, to 8 cm long, basal collar present and composed of up to 20 connate sterile carpels, mostly broadly to shallowly conical or oblong-ellipsoid, to 18 mm long, fertile carpels 30-350(-450), narrowly to broadly angular-obovoid, or obconical, tetragonous to hexagonous, to 30(-35) mm long, apex flat, truncate, conical to broadly conical or uncinate, carpels fused over basal 1/4 or fully fused, rarely completely free. Seed filling up 3/5-6/7 of the carpel, narrowly to broadly ovoid or obovoid, tawny, reddish-brown to dark brown, smooth, roughish or rugged.

Key to the species

1. Lower side of lamina densely covered with contiguous scales even when old. 2
1. Lower side of lamina, when old, sparsely covered with scales not touching each other or nearly glabrous. 5

2. Small shrubs, usually no more than 3 m tall; lamina narrowly obovate to obovate, bract below articulation more than 3 mm in length; carpels shorter than 17 mm; seeds shorter than 11 mm; C, E, and SE Brazil. .... *1. D. furfuracea*

2. Trees or rarely big shrubs, (2-)5-20(-30) m tall; lamina narrowly ovate to ovate, narrowly elliptic to elliptic, bract below articulation shorter than 3 mm; carpels more than 17 mm long; seeds more than 11 mm in length.........3

3. Carpels at apical part straight (not contracted); seeds usually with 2-4 ribs. 4

3. Carpels at apical 1/5 to 1/4 usually suddenly contracted and forming a peltate top; seed without ribs; Amazonas, Pará, and Maranhao. ....*6. D. lepidota*

4. Lamina narrowly ovate (to narrowly elliptic), upper side sparsely (to rather densely) covered with stellate hairs; fertile carpels tetragonous, broadly to transversely rhombic in transverse section, top smooth; seeds narrowly ovoid to narrowly ellipsoid; C Brazil. .... *4. D. marcgraviana*

4. Lamina elliptic, oblong-elliptic (to narrowly ovate), upper side glabrous from the very beginning; fertile carpels angular-obovoid to obconical, top irregularly rugose; seeds obovoid; N and NE Brazil.........*5. D. echinophora*

5. Upper side of lamina sparsely to rather densely covered with stellate hairs; Bahia. ....*2. D. dicholepidota*

5. Upper side of lamina glabrous, slightly shiny. 6

6. Lamina rounded (-acute or apiculate) at the apex, rounded (-obtuse) at the base. 7

6. Lamina acute to acuminate at the apex, acute to attenuate at the base. . 8

7. Carpels densely covered with scales and stellate hairs, basal 1/2 to 3/5 fused; inner side of bracts densely covered with curviform stellate hairs; apical prolongation of connective glabrous; ovary sparsely to rather densely covered with curviform stellate hairs; Bahia and Sergipe. .... *3. D. moricandiana*

7. Carpels glabrous, totally free from each other; inner side of bracts glabrous; apical prolongation of connective puberulous, ovary glabrous; Brazil (Mato Grosso) and Bolivia (Santa Cruz). .... *7. D. glabriuscula*

8. Fertile carpels glabrous; ovary glabrous, style sparsely to densely covered with erect stellate hairs; from Minas Gerais to Santa Catarina. .... *8. D. lanceolata*

8. Fertile carpels sparsely to densely covered with stellate scales; ovary densely covered with stellate scales and/or stellate hairs, upper part of style glabrous. 9

9. Lamina broadest at the middle, narrowing more or less equally toward both ends; São Paulo. .... *11. D. salicifolia*

9. Lamina broadest below the middle, narrowing more quickly toward the base than toward the apex. 10

10. Lamina 2.5-4(-4.5) cm wide, index 2-3(-3.5), lower side sparsely (0-2 scale/mm2) covered with stellate scales; apical prolongation of connective puberulous; top of carpels conical or uncinate, yellowish, densely covered with stellate scales and hairs; from Ceará to Rio de Janeiro. .... *9. D. riedeliana*

10. Lamina (1.2-)1.4-2 cm wide, index 4.5-6(-6.4), lower side rather densely (3-9 scales/mm2) covered with stellate scales; apical prolongation of connective glabrous; top of carpels truncate, blackened, sparsely covered with stellate scales; Rio de Janeiro. .... *10. D. microphylla*

1. *Duguetia furfuracea* (A. de St. Hilaire) Bentham et Hooker f., Gen. pl. 1: 24. 1862; R. E. Fries, Acta Horti Berg. 12(1): 35. 1934. Figure 4

Annona furfuracea A. de St. Hilaire, Fl. Bras. Merid. 1: 34. t.6. 1825. Martius, Fl. bras. 13(1): 8. 1841. Type: Brazil. Minas Gerais: without locality, 1816-1821, *A. de Saint Hilaire s.n.*, fl. (syntypes, P [a lectotype still has to be selected]; duplicates in F, G, NY).

Duguetia coriacea Sonder, Linnaea 22: 557. 1849. Type: Brazil. Minas Gerais: Caldas (fr), *Regnell II-3* (syntype, O); Brazil. Minas Gerais: Uberaba, "ad Formizas", 13 Dec 1848 (fl), *Regnell II-3* (syntype, S); Brazil. São Paulo: Canna Verde, Apr 1848 (fl), *Regnell II-3* (syntypes, MO, S); Brazil. São Paulo: Batataes, Apr 1848 (fl), *Regnell II-3* (syntype, S).

Aberemoa furfuracea (A. de St. Hilaire) Baillon, Hist. pl. 1: 204. 1868; R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl., n.s., 34(5): 21. 1900.

Aberemoa furfuracea (A. de St. Hilaire) Baillon var. *jonasiana* Barbosa Rodrigues, Pl. mattogr. 7. t. 4. 1898. Type: Brazil. Mato Grosso: near Rio Coxipó and Rio do Peixe, near Cuiabá, Jun 18??, *Barbosa Rodrigues s.n.* (not seen).

Aberemoa jonasiana (Barbosa Rodrigues) R. E. Fries, Ark. Bot. 4(19): 10. t.1, f.9. t.2, f.6-8. 1905.

Duguetia jonasiana (Barbosa Rodrigues) R. E. Fries, Acta Horti Berg. 6(6): 16. 1919, 12(1): 38. 1934.

Duguetia hemmendorffii R. E. Fries, Acta Horti Berg. 12(1): 37. 1934. Type: Brazil. São Paulo: Santa Rita do Passo Quatro, Santa Albertina, 2 Feb 1900 (fl), *Hemmendorff 278* (holotype and 3 isotypes, S).

Shrub, (0.5-)1-1.5(-3) m tall. Young twigs densely covered with yellowish fimbriate to stellate scales, becoming glabrous with age, older twigs yellowish-brown to dark brown, irregularly striate. Petiole (1.5-)2-4(-5) mm long, (1-)1.8-2.5 mm in diam., densely covered with yellowish fimbriate scales. Lamina narrowly obovate to obovate (narrowly oblong-obovate to oblong-obovate), coriaceous, green to greenish-yellow above, greenish-yellow to yellow below, (6-)9-14(-17) cm long, (2-)3-5(-6) cm wide, index 2-3.5(-5.5), base narrowly cuneate (broadly cuneate, attenuate or rarely obtuse), apex obtuse to acute (acuminate or rarely rounded), upper side sparsely to densely covered with yellowish, (6-)8-18(-20)-rayed appressed or erect stellate hairs and/or stellate scales, becoming sparsely covered or glabrous with age (permanently hairy on the base of primary vein), lower side densely covered with yellowish fimbriate to stellate scales, secondary veins uniformly curved, (9-)10-15(-17) on either side of primary vein, angles with primary veins (50°)60°-70°(-85°), intercostal area irregularly spaced, distance between the middle of closure and margin (1-)1.5-4(-5) mm, tertiary veins slightly raised on upper side, flat to slightly raised on lower side, irregularly forming (1-)2-12(-16) nets, 4th order veins slightly raised to flat on both sides, but nearly invisible on lower side because of the rather densely covering of scales.

Inflorescence leaf-opposed, 1-2-flowered, subsessile, pedicel (7-)10-15(-17) mm long, recurved, 1-2 mm in diam. at base, (3-)3.5-5(-6) mm in diam. just below flower. Fruiting pedicel (11-)15-30 mm long, 2-3.5(-4) mm in diam. at base, (3-)3.5-5(-6) mm in diam. below the fruit. Bracts 2 to the pedicel, one amplectant on basal 1/3 to 1/2(-5/6) of pedicel, very broadly or depressed

ovate to subcircular, 3-5 mm long, 5-7 mm wide, easily broken, another one triangular, 4-5 mm long, 2.5-3.5 mm wide. Pedicels and outer side of bracts densely covered with yellowish fimbriate to stellate scales, inner side of bracts rather densely to densely covered with curviform stellate hairs; outer side of sepals densely covered with yellowish fimbriate scales, inner side densely covered with curviform stellate hairs (at basal 1/5 to 1/3 usually sparsely covered); outer side of petals rather densely to densely covered with yellowish fimbriate to stellate scales, inner side densely covered with curviform stellate hairs (basal 1/5 to 2/5 of outer petals and 1/3 to 1/2 of inner petals glabrous).

Flower buds broadly ovoid to subglobose, apex obtuse to rounded, (8-)9-12 mm long, 8-12 mm in diam. Flowers green, yellow or red, with dark red at inner base (in vivo). Sepals connate to 1/5-1/4 from base, ovate to broadly ovate (triangular to broadly triangular), (7-)10-15(-22) mm long, (5.5-)9-12(-14) mm wide. Outer petals elliptic to rhombic-elliptic, apex acute, (10-)15-20(-30) mm long, 6-9(-12) mm wide, inner petals rhombic-elliptic to elliptic, apex acute, (10-)16-20(-30) mm long, 6-9(-13) mm wide. Torus depressed ovoid. Stamens 150-300, 0.9-1.2 mm long, 0.5-0.6 mm wide, apical prolongation of connective very shallowly conical, puberulous, 0.2-0.4(-0.5) mm long, 0.7-0.9 mm wide. Carpels 40-150, ovary and stigma sparsely to densely covered with erect stellate hairs.

Fruiting receptacle ellipsoid (oblong-ellipsoid), 15-20 mm long, 5-8 mm in diam. Fruit green to greyish-green (greenish-brown) (in vivo), spheroid (ellipsoid), (2-)3-5(-7) cm in diam., the basal collar composed of 10-16 connate sterile carpels, (broadly conical) deltoid, 6-12 mm long, 6-14 mm in diam., covered with some scales and stellate hairs, fertile carpels (40-)70-140, obconical, 10-15 mm long, 10-14(-17) mm in diam., with 4-5 ribs or without rib, top itself flat, depressed ovoid to conical, densely covered with scales and stellate hairs, fused in the basal (2/3-)5/6 to totally. Seed filling up to (2/3-)5/6 of the carpel, obovoid to broadly obovoid, 9-11 mm long, 7-9 mm in diam., yellowish-brown to reddish-brown.

Distribution (Figure 1). C, S, and SE Brazil (Mato Grosso, Paraná, Distrito Federal, São Paulo, Minas Gerais, Bahia, and Goiás) to NE Brazil (Ceará), also in Paraguay and Bolivia. Typical pyrophyte, highly adapted to Central Brazilian savannas. Common, particularly in various cerrado types (campos rupestres, arboreous cerrado, open grassy to shrubby campos) or in dense secondary forest, at elevation from 200 to 1400 m, but mainly restricted

to deep white or brown sandy soil, rarely on red elay or lateritie soil. It is a small shrub with several-many aseending stems whieh sprout from a woody, elongate xylopodium. Flowering and fruiting all the year around, but mostly flowering from November to May and fruiting from September to June.

Specimens examined. Bahia: Espigão Mestre, 23 km W of Barreiras, 680 m, 3 Mar 1972 (fl), *W. R. Anderson et al. 36544* (AAU, NY, U); 16 km NW of Lagoinha on side road to Minas do Mimoso, 950-1000 m, 4 Mar 1974 (fl), *Harley et al. 16717* (CEPEC, K, MO, NY, P, U, US); 15-20 km from Andarai, along the road to Itaeté whieh branches E off the road to Mueugé, 500-600 m, 13 Feb 1977 (fl & fr), *Harley et al. 18634* (CEPEC, F, K, MO, NY, U, US); lower NE slopes of the Pieo das Almas, 25 km WNW of the Vila do Rio de Contas, 1400 m, 20 Mar 1977 (fl), *Harley et al. 19748* (CEPEC, M, NY, U, US); Rio Piau, 225 km SW of Barreiras, 850 m, 12 Apr 1966 (fl), *Irwin et al. 14639* (F, NY, S, SP, US); 5 km S of Rio Roda Velha, 900 m, 15 Apr 1966 (fl), *Irwin et al. 14870* (F, NY, S, SP, US); road to Agua de Rega, 23 km N of Seabra, 1000 m, 24 Feb 1971 (fl), *Irwin et al. 30914* (F, MO, NY, U, US); Mun. Formosa do Rio Preto, 550 m, 8 Apr 1989 (fl), *Mendonça et al. 1374* (U); Highway-BA-265, 9 km E of Vietória da Conquista, 900 m, 4 Mar 1978 (fl), *Mori et al. 9437* (CEPEC, U); Mun. Caetité, 2 km S of Caetité, 800 m, 19 Mar 1980 (fl), *Mori & Benton 13472* (CEPEC, U); Mun. Piatã, Piatã, 1100 m, 3 Mar 1980 (fl & fr), *Mori & Funch 13369* (CEPEC, NY); Mun. Formosa do Rio Preto, 7 Apr 1989 (fl), near Rio Riachao, *Walter et al. 210* (IBGE, U). *Ceará:* Serra do Araripe, 12 Km SE of Crato, 800 m, 14 Jun 1944 (fr), *Cutler 8116* (F, US); top of Chapada de Araripe, 10 Km S of Crato, 950 m, 13 Feb 1985 (fr), *Gentry et al. 50040* (G, M, U); Taboea, Serra do Araripe, 14 May 1934 (fl), *von Luetzelburg 26061* (M, NY). *Distrito Federal:* Brasília, Baeia do Rio São Bartolomeu, 15 Apr 1980 (fl & fr), *Heringer et al. 4372* (MO, U, US); Brasília, 6 km from Caehoeirinha, 14 Jan 1981 (fl), *Heringer et al 5971* (K, MO, U, US); Brasília, Convênio Florestal, 10 Feb 1962 (fl), *Heringer 8868* (NY); Brasília, Horto do Guará, 24 Apr 1974 (fl), *Heringer 13250* (U); Brasília, Monumento do Candango, 12 Nov 1980, *Heringer 17966* (NY); 20 km S of Brasília, on road to Belo Horizonte, 700-1000 m, 26 Aug 1964 (fl), *Irwin & Soderstrom 5572* (NY, S, SP). *Goiás:* Serra dos Cristais, 12 km N of Cristalina, 1060 m, 3 Apr 1973 (fl), *W. R. Anderson et al. 8025* (F, MO, NY, U, US); 26 Km W of Rio Verde, 7 Jul 1966 (fl), *Goodland 482* (NY); 6 km S of Cristalina, 1175 m, 5 Nov 1965 (fl), *Irwin et al. 9952* (F, GH, MO, NY, S, SP); 5 km E of Goiás boundary on road to Guarapauá, 1000 m, 16 Nov 1965 (fl), *Irwin et al. 10295* (F, MO, NY, S, SP); 3 km N of Cristalina,

1250 m, 2 Mar 1966 (fl), *Irwin et al. 13266* (F, MO, NY, SP); Rio da Prata, 6 km S of Posse, 800 m, 4 Apr 1966 (fl & fr), *Irwin et al. 14357* (NY, S, SP); 70 km SE of Aragarças, road to Piranhas, 700 m, 23 Jun 1966 (fr), *Irwin et al. 17646* (F, MO, NY, S, US); 45 km S of Caiapônia, road to Jataí, 900 m, 28 Jun 1966 (fr), *Irwin et al. 17913* (F, NY, S, SP, US); 15 km S of Niquelândia, 1000 m, 21 Jan 1972 (fl), *Irwin et al. 34693* (NY); Mun. Piranhas, 30 km N of Piranhas, 26 Feb 1982 (fl), *Oliveira & Anderson 475* (MICH, U). *Mato Grosso:* Belo Horizonte, Cardoso, 20 Nov 1932 (fl), *Barreto 420* (RB); Aquidauna, 23 Jul 1972, *de Jesus 1730* (RB); Mun. Barra do Garças, 7 km N of Córrego Tangúru, 12 Dec 1969 (fl), *Eiten & Eiten 9890* (SP, US); Mun. Rio Brilhante, Fazenda Bela Vista, 25 Jan 1971 (fl), *Hatschbach 26118* (C, UC); Mun. Campo Grande, road from Campo Grande to Rochedo, 12 Jul 1969 (fl & fr), *Hatschbach & Guimarães 21837* (S, UC); Mun. Nova Andradina, Douradinho, 12 Apr 1972 (st), *Hatschbach 29419* (UC); Mun. Bataguaçu, Rodovia BR-265, 6 Feb 1975 (fl), *Hatschbach et al. 35904* (U); 20 km N of Amambai, Rodovia MT-642, 16 Dec 1983 (fl), *Hatschbach & Callejas 47293* (U); 20 km S of Garapú, 300-400 m, 30 Sep 1964 (fr), *Irwin & Soderstrom 6491* (F, GH, NY, P, S, SP); Rio Turvo, 210 km N of Xavantina, 500 m, 28 May 1966 (fr), *Irwin et al. 16206* (F, NY, SP, US); 86 km N of Xavantina, 550 m, 3 Jun 1966 (fl & fr), *Irwin et al. 16528* (F, NY, S, SP, US); 80 miles out of Campo Grande on road to São Paulo, 500 m, 24 Nov 1959 (fl), *Maguire & Maguire 44529* (NY); 370 km W of Cuiabá, 26 Sep 1963 (fr), *Maguire et al. 56853* (NY); Cuiabá, 17 Jun 1902 (st), *Malme 1779a* (S); Mun. Rio Pardo, 700 m, *Martinelli 402* (RB); Mun. Chapada dos Guimarães, 3 km W of Buriti, 600 m, 12 Jul 1984 (fr), *Mori et al. 16717* (CEPEC, U); Mun. Rio Brilhante, Posto Zuzu, 6 Sep 1979 (fl), *P. I. Oliveira 9* (U); Mun. Santana do Riacho, Mãe d' Agua, along road from Belo Horizonte to Conceiçao do Mato Dentro, 12 Jan 1981 (fl), *Rossi et al. CFSC6985* (K); highway from Campo Grande to Aquidauana, 10 km from Fazenda Leão, 14 Dec 1976 (st), *Shepherd et al. 4133* (RB); Mun. Três Lagoas, Mar 1960 (st), *Vália 60* (NY, SP). *Minas Gerais:* Serra do Espinhaço, 6 km N of Gouvêia on road to Diamantina, 1250 m, 10 Apr 1973 (fl), *W. R. Anderson et al. 8585* (F, MO, NY, RB, U, US); Vicinity of Mendanha, 24 Sep 1936 (fr), *Archer 4069* (A, NA, RB); between Patos and Pirapora, 17 Sep 1963 (fr), *Castellanos 24190* (GUA); Serra de Lenheiro, São João Del-Rei, Jan 1960 (y fl), *Duarte 5136* (NY, RB); Belo Horizonte, Leitão, 5 Feb 1919 (fl), *Gehrt SP3200* (NY, S, SP); Turvo, 24 Apr 1926 (fl), *Gehrt SP17501* (S); N of Uberaba, 426.8 km from Brasília, 9 May 1966, *Goodland 326* (NY, U); Mun. Prata, Rio Douradinho, 23 Jul 1977 (fr), *Hatschbach 40053* (NA); between Brasília and

João Pinheiro, 30 Aug 1979 (st), *Heringer & Rizzini 17419* (U); Serra do Espinhaço, 28 km SW of Diamantina on road to Gouveia, 1300 m, 15 Jan 1961 (fl), *Irwin et al. 22017* (MO, NY, U); 25 km W of Monte Claros, road to Agua Boa, 1000 m, 23 Feb 1969 (fl), *Irwin et al. 23699* (AAU, NY, RB, U); 25 km NE of Patrocínio, 1050 m, 28 Jan 1970 (fl), *Irwin et al. 25488* (F, MO, NY, U); Serra da Anta, 2 km NW of Paracatú, 700 m, 7 Feb 1970 (fl), *Irwin et al. 26312* (F, MO, NY, U, US); Rio Bicudo, 20 km W of Corinto, 525 m, 3 Mar 1970 (fl), *Irwin et al. 26817* (F, MO, NY, RB, U, US); Serra do Espinhaço, 25 Km E of Diamantina, near Rio Jequití, 800 m, 15 Mar 1970 (fl), *Irwin et al. 27569* (HBG, NY, U); 10 km S of São João da Chapada, 1150 m, 27 Mar 1970 (fr), *Irwin et al. 28427* (F, MO, NY, RB, U, US); 53 km E of Araxá, Rio Quebra Anzol, 30 Jan 1978 (fl), *Krapovickas et al. 33360* (WIS); Mun. Grão Mogol, road to Francisco Sá, 10 km from Grão Mogol, 10 May 1979 (fl), *H. C. Lima et al. 969* (RB, U); 2 km from Alfenas, 26 Feb 1963 (fl), *Magalhães 11* (SP, U); Mun. Prata, 2 km from Prata. 19 Mar 1963 (fl), *Magalhães 52* (P, RB, S, SP, U); Mun. Patrocínio, Fazenda Grão de Ouro, 28 Feb 1989 (fl), *Mendonça et al. 1179* (U); Pirapora, 5 Mar 1962 (fl), *Rizzini RB114058* (RB); Lavras, 15 Jan 1914 (fr), *Shamel et al. 235b*(US). *Paraná:* Itararé, 16 Apr 1910 (fl), *Dusén 9667* (G, MO, S); Jaguariaiva, 19 Apr 1910 (fl), *Dusén 9731* (F, GH, MICH, MO, NY, S); Mun. Paraguaçu Paulista, 4 km N of Paraguaçu Paulista, 500 m, 10 Feb 1965 (fl), *Eiten et al. 6024* (MO, NY, SP, US); Mun. Cianorte, Fazenda Lagoa, 28 Apr 1966 (fl), *Hatschbach 14251* (NY, P, U, US, WIS); Campo Mourão, 8 Dec 1965 (fl), *Hatschbach et al. 13276* (U); Jaguariaiva, 19 May 1914 (fl), *Joensson 386a* (S, Z); Fazenda Lagoa, S of Rio Ivaí, 15 km E of São Tomé, 5 Apr 1966 (fl), *Lindeman & de Haas 894* (C, F, NY, U, W); 3 km N of Campo Mourão, 26 Jan 1967 (fl), *Lindeman & de Haas 4500* (NY, U). *Rondônia:* Vilhena, 4 Jan 1979 (fl), *M. G. Silva & A. Pinheiro 4136* (NY, U, US). *São Paulo:* Loreto, *Battistella 213=SP14511* (S, SP); Jeriquara, 26 Mar 1967 (fl, fr), *Bicalho 30* (SP); Moóca,20 Apr 1913 (fl, fr), *Brade 5882* (S, SP); Braste, Jaguariuna, *Brantjes 701607* (U); Fazenda Paulistas, Matão, 24 May 1955 (st), *Dedecca 514* (UC); Mun. São Carlos, 5 km NW of São Carlos, 28 Jan 1961 (st), *Eiten & Eiten 2535* (SP); Mun. Brotas, NW of the intersection of Brotas-Itirapina road with the road to Campo Alegre, 750 m, 16 Jun 1961 (fl), *Eiten et al. 2962* (SP); Barretos, Rio Pardo, Nov 1917 (st), *Frazão RB8659* (S); São Miguel, 19 Jan 1944 (fl), *Gonçalves SP50361* (SP); Moji-Guaçú, 27 Apr 1979 (fl), *O. Handro 2294* (SP, US); Santa Rita do Passa Quatro, *Hemmendorff 279* (S); Santa Rita do Passa Quatro, 27 Nov 1981 (fr), *Kirizawa & Morretes 608* (SP); Anhembí, Fazenda Barreiro Rico, 2 May 1959 (fl), *M. Kuhlmann 4524* (SP);

Mun. Itapetininga, km 150 of road Raposo Tovares, 17 Jul 1962, *Labouriau 113* (SP); São Simão, 6 Feb 1964 (fl), *Labouriau & Válio 1098* (SP); Sorocaba, Dec 1817 (fl), *Martins 550* (M); Serra do Botucatú, 14 Mar 1967 (fl), *Mattos & Mattos 14427* (SP); Sorocaba, 30 Jun 1934 (fr), *Mendes 1* (SP); Itú, 15 Feb [no year] (fl), *Russel 286* (S, SP); Fazenda Hollambra, 35 km N of Campinas, 600 m, 25 Feb 1976 (fl), *Shepherd & Gibbs 11246* (K, NY); Fazenda Graciosa, between Sao Carlos and Descalvado, 2 Feb 1966 (fl), *Siqueira 8* (SP); Jundiaí, 3 Feb 1907 (fl), *Usteri 3a=SP17878* (K, S, SP); Mun. Itirapina, 5 km from Rodovia Washington Luiz, near road from Itirapina to Rio Claro, 11 Apr 1962 (fl), *Válio 269* (P, RB, SP).

Vernacular Names. Araticum, Araticum-do-campo, Araticum-rasteiro, Araticum-vermelho, Araticunzinho/Araxicunzinho, Araticum lanceta, Ata, Ata do Campo, Aticum, Bruto, Moroua/alathê, Orelha-de-burro, Pinha braba, Pinha brava, Pinha do Campo.

This is the most widespread and common species of the group. It is also the most variable one, especially in the shape and size of the leaves. The shape of the lamina is mainly narrowly obovate to obovate, sometimes very narrow, the leaf index mainly falls into the range from 2 to 3.5, but on some specimens it is much higher (5-6). Generally speaking, most collections from Paraguay have narrower and smaller leaves than those from Brazil. But it is hardly possible to give them a formal taxonomic rank to express the infra-specific differentiation within *D. furfuracea* because intermediate forms can be found easily.

Based on the narrow leaf shape and the glabrescent upper side of the lamina, Fries distinguished *D. hemmendorffii* from *D. furfuracea*, be it with some reluctance. *D. jonasiana* was distinguished from *D. furfuracea* on the base of its narrow leaves with the upper side glabrous from the very beginning, and its narrow petals.

In this paper, the three species are considered to be conspecific. In overall resemblance, *D. hemmendorffii* is within the variation range of *D. furfuracea*, and there is no reason for keeping it apart.

The inclusion of *D. jonasiana* may need some more explanation. The main distinctive feature of *D. jonasiana* appears to be the upper leaf surface which is glabrous from the very beginning. In typical *D. furfuracea* the leaves are sparsely to densely covered with stellate scales. In *D. jonasiana*, however, the primary vein does appear to be covered with some hairs, too. In *D.*

furfuracea, on the other hand, leaves may become glabrous above with age. The difference, therefore, is only small, and certainly does not provide sufficient reason for maintaining two species. As for other characters, we were unable to find any differences that could support a specific status for *D. jonasiana*, and, consequently, we united it with *D. furfuracea*.

2. *Duguetia dicholepidota* Martius, Fl. Bras. 13(1): 22. 1841; R. E. Fries, Acta Horti Berg. 12(1): 43. 1934. Type: Brazil. Bahia: Serra do Açurua, Sertão de Rio San Francisco, 1839 (fl & fr), *Blanchet 2828* (lectotype, G, selected here; isolectotypes, B, BM, F, G, K, NY, OX, P,). Figure 5

Shrub to 3 m tall, young twigs densely covered with yellowish stellate scales, becoming glabrous with age, older twigs greyish brown to dark brown, irregularly ribbed. Petiole 2-3(-4) mm long, (1.2-)1.5-2(-2.5) mm in diam., (sparsely to) densely covered with stellate scales. Lamina elliptic ovate to narrowly ovate, coriaceous, dark glossy green above, green below, (5-)7-10(-12) cm long, (2.2-)3-4 cm wide, index 2-2.5(-2.9), base rounded to obtuse (acute), apex acute to acuminate (acumen 5-10 mm long), upper side sparsely to rather densely covered with whitish, (6-)7-15(-17)-rayed appressed or erect stellate hairs, becoming glabrous with age (primary vein permanently covered with stellate hairs), lower side densely covered with yellowish to whitish stellate scales, becoming sparsely covered with age, secondary veins abruptly curved, (8-)10-14(-16) on either side of primary vein, angles with primary veins (60°-)65°-80°(-90°), intercostal area somewhat regularly spaced, distance between the middle of closure and margin 2.5-4(-5) mm, tertiary veins slightly raised on both sides, irregularly forming 5-11 nets, 4th order veins slightly raised on upper side, nearly invisible on lower side.

Inflorescence leaf-opposed, 1-2-flowered, sessile, pedicels (5-)8-12(-14) mm long, 1-1.5(-1.8) mm in diam. at base, (1.5-)1.8-2.2(-3) mm in diam. just below flower, fruiting pedicel 11-17 mm long, 1.5-2.5 mm in diam. at base, 2.8-3.8 mm in diam. just below the fruit. Bracts 2 to the pedicel, one amplectant on basal 1/3 to 1/2 of pedicel, transversely broadly elliptic, apex mucronulate with a 1-1.5 mm long tip, 3-6(-8) mm long, 3-4.5(-6) mm wide, another one shallowly triangular, 2-3 mm long, 3-4 mm wide. Pedicels and outer side of bracts densely covered with yellowish fimbriate to stellate scales, inner side of bracts densely covered with curviform stellate hairs; outer side of sepals densely covered with yellowish fimbriate to stellate scales, inner side densely covered with curviform stellate hairs (at basal 1/5 to 1/3 usually sparsely covered):

outer side of petals rather densely (to densely) covered with yellowish stellate scales, inner side densely covered with curviform stellate hairs (basal 1/5 of outer petals and 1/3 of inner petals glabrous).

Flower buds very broadly ovoid, apex obtuse to mucronate, 5-7 mm long, 5-6.5 mm in diam. Flowers yellowish green (in vivo). Sepals connate to 1/5-1/4 from base, (broadly) triangular to (broadly) ovate, apex acute to mucronate, 11-15 mm long, 8-11 mm wide. Outer petals rhombic-elliptic, apex acute (mucronate), 16-19(-21) mm long, 10-11.5 mm wide, inner petals rhombic-elliptic to elliptic, apex acute to mucronate, 14-18(-22) mm long, (9-)10-12 mm wide. Torus depressed ovoid. Stamens 200-280, 1.1-1.4(-1.6) mm long, (0.3-)0.4-0.5(-0.7) mm wide, apical prolongation of connective shallowly to very shallowly conical, puberulous, (0.1-)0.2-0.3(-0.4) mm long, 0.7-0.8 mm wide. Carpels 120-150, stigma sparsely covered with curviform stellate hairs and ovary sparsely to rather densely covered with curviform stellate hairs.

Fruit greyish-green (in vivo), spheroid, ca. 3 cm in diam., the basal collar composed of 10-14 connate sterile carpels, deltoid, ca. 7 mm long, 5-6 mm in diam., rather densely covered with scales and stellate hairs. Fertile carpels ca. 80, obovoid to angular-obovoid, 11-13 mm long, 6.5-9 mm in diam., with a 0.5-1 mm long unciform tip, densely covered with stellate scales and stellate hairs, fused in the basal 1/4 to 1/3, apical free parts spacing 1-2.5 mm apart. Seed filling up to 5/7 to 6/7 of the carpel, ellipsoid, 9-11 mm long, 5-6 mm in diam., smooth, tawny to reddish brown.

Distribution (Figure 3). Only known from Açuruá, E Bahia; in caatinga vegetation.

Specimen examined. Bahia: Serra do Açuruá, 12 km E of Gentio do Ouro on road to Boa Vista and Ibipeba, 500-700 m, 22 Feb 1977 (fl & fr), *Harley et al. 18917* (CEPEC, K, M, NY, U).

Fries's referring to "*Duguetia dolicholepidota* Mart." (Fries 1959) is obviously an error for *D. dicholepidota* Mart.

Owing to the strong similarity in flowers and fruits with *D. furfuracea*, *D. dicholepidota* should be placed near *D. furfuracea*, rather than near *D. marcgraviana* as was suggested by R. E. Fries (1934). One might wonder if the two collections of *D. dicholepidota*, known from the type locality only,

justify the maintenance of a separate species. But it can be distinguished from *D. furfuracea* by the sparse indument on the lower side of the mature lamina, the abruptly curved secondary veins, the more regularly spaced intercostal areas, a larger angle between secondary veins and the primary vein, and by the fruit with carpels only fused in the basal 1/4th to 1/3rd part.

3. *Duguetia moricandiana* Martius, Fl. Bras. 13(1): 22. 1841; R. E. Fries, Acta Horti Berg. 12(1): 44. 1934. Type: Brazil. Bahia: without location, 1834 (fl & young fr), *Blanchet 1678* (holotype, G (2 sheets); isotypes, BM, F). Figure 6

Tree or shrub, (0.4-)3-5 m tall. Young twigs densely covered with yellowish fimbriate scales becoming glabrous with age, older twigs greyish-white, ribbed. Petiole darkened, 2-6 mm long, 1.5-2.5 mm in diam., sparsely covered with fimbriate scales, sometimes nearly glabrous. Lamina elliptic to oblong-elliptic (obovate), coriaceous, green to dark green above, brownish-green below, (4-)5.5-10(-12.5) cm long, (2.5-)3-5.5(-7) cm wide, index 1.5-2(-2.2), base rounded (obtuse), apex rounded (apiculate or mucronate), upper side essentially glabrous, lower side densely covered with stellate scales when young and becoming sparsely covered (on primary vein permanently densely covered), secondary veins abruptly curved, (5-)7-10(-12) on either side of primary vein, angles with primary vein 50°-70°(-75°), intercostal area somewhat regularly spaced, distance between the middle of closure and margin 4-8 mm, tertiary veins conspicuous, raised on both sides, irregularly forming 5-10(-13) nets, 4th order veins subconspicuous.

Inflorescence leaf-opposed or pseudo-terminal, directly attached to the twigs or on the top of a 5-8 mm long rudimentary twig, simple, 1-2-flowered. Pedicels 8-10 mm long, 1-1.5 mm in diam. at base, 2-2.5 mm in diam. just below flower, fruiting pedicels 11-18 mm long, 2-3.5 mm in diam. Bract(s) 1-2 to the pedicel, one on basal 1/3 to 1/2 of pedicel, (deltate) broadly ovate, 1-2 mm long, 1-1.8 mm wide, another one (if present) triangular, 0.5-1 mm long, 0.3-0.8 mm wide. Indument of floral parts: peduncle, pedicel and outer side of bracts rather densely to densely covered with yellowish fimbriate scales, inner side of bracts densely covered with curviform stellate hairs; outer side of sepals densely covered with yellowish fimbriate scales, inner side densely covered with whitish curviform stellate hairs; outer side of petals rather densely to densely covered with yellowish stellate scales, inner side densely covered with curviform stellate hairs.

Flower buds broadly ovoid, apex mucronate with a ca. 2 mm long apicule, 8-10 mm long, 7-9 mm in diam. Flowers greenish-white to yellow (in vivo). Sepals connate to 1/4-1/3 from base, broadly triangular-ovate, apex acute to acuminate with a 1.5-2.5 mm long acumen, 9-12 mm long, 5-9 mm wide. Outer and inner petals almost the same, elliptic (obovate), (7-)9-13(-15) mm long, 5-6.5(-9.5) mm wide. Torus depressed ovoid, with an ovoid apicule. Stamens 200-250, 1.1-1.3 mm long, 0.4-0.5 mm wide, apical prolongation of connective very shallowly triangular, glabrous, 0.2-0.4 mm long, 0.4-0.6 mm wide. Carpels 40-80, stigma and ovary sparsely to rather densely covered with curviform stellate hairs.

Fruit unknown (only loose carpels present). Fertile carpels >30, broadly obtrulloid with 5-6 ribs, 14-16 mm long, 7-9 mm in diam., apex forming a ligneous cap 6-10 mm long, 8-10 mm across, the top of the cap densely covered with scales and stellate hairs, with a 1-2 mm long curved apicule, basal 1/2 to 3/5 of carpels fused. Seeds filling up to 5/6 of the carpel, obovoid (broadly obovoid), 10-13 mm long, 7-9 mm in diam., dark brown, smooth and slightly shiny.

Distribution (Figure 3). Only known from the Brazilian states Bahia and Sergipe. Growing in dunes and restinga. Flowering and fruiting all the year around.

Specimens examined. Bahia: Mun. Salvador, Alamedas da Praia, between Itapuã and airport, 25 Jan 1977 (fr), *J. S. Araújo et al. 135* (CEPEC); Mun. Salvador, 3 km from Salvador, W of airport, 12 Nov 1983 (fl), *Callejas & Carvalho 1744* (CEPEC, U); Mun. Salvador, 30 km N of Salvador, near airport, 2 Jan 1982 (fl), *Carvalho et al. 1092* (CEPEC); Itapuã near Lagoa de Abaeté, Salvador, 17 Jun 1985 (fl), *M. L. Guedes et al. 15826* (CEPEC); Mun. Salvador, Itapuã, near airport Dois de Julho, 23 May 1981 (fl), *Mori et al. 14078* (CEPEC, NY); Km 4 of the highway from Bahia to Rio de Janeiro, Jaguaquara, 6 Jul 1971 (fr), *Pinheiro 1420* (CEPEC); Jaguaquara, km 6 of the highway from Bahia to Rio de Janeiro, 3 Oct 1972 (fl), *Pinheiro 1961* (CEPEC); Mun. Salvador, along road from Itapuã to airport Dois de Julho, 27 Jan 1983 (fl), *Plowman 12783* (CEPEC, F, U). *Sergipe:* Piramba, 19 Nov 1974 (fl), *Fonsêca* 131 (RB).

Although closely related to *D. furfuracea*, this species can easily be distinguished from *D. furfuracea* by the shape of the leaves and their indument. It should be pointed out, that the fruit is poorly known. Only individual carpels of one collection (*J. S. Araújo 163*) were available.

4. *Duguetia marcgraviana* Martius, Fl. Bras. 13(1): 25. 1841; R. E. Fries, Acta Horti Berg. 12(1): 42. 1934. Type: Brazil. Mato Grosso: location unknown (" in locis tempore pluvioso inundatis pr. Mato-Grosso "), Feb 1828 (st), *Riedel 1471* (lectotype, LE, selected here a collection annotated by Martius; isotypes, BR, LE, S). Figure 7

Aberemoa marcgraviana (Martius) R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl., n.s., 34(5): 20. 1900.

Duguetia sanctae-crucis S. Moore, Trans. Linn. Soc. London, Bot. ser.2. 4: 299. 1895. Type: Brazil. Mato Grosso: Santa Cruz, Nov 1891 (fr), *S. Moore 576* (holotype, BM; isotype, B).

Aberemoa sanctae-crucis (S. Moore) R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl., n.s., 34(5): 22. 1900.

Aberemoa brevipedunculata R. E. Fries. Ark. Bot. 4(19): 8. t.1, f.10. 1905. Type: Brazil. Mato Grosso: Santa Anna da Chapada, 18 Sep 1902 (fl, fr), *Malme II-2322* (holotype & isotype, S).

Duguetia brevipedunculata (R. E. Fries) R. E. Fries, Acta Horti Berg. 6(6): 16. 1919, 12(1): 40. 1934.

Tree (or rarely shrub), (2-)3-15(-25) m tall, stems 10-25(-30) cm in diam. Young twigs densely covered with yellowish fimbriate scales, becoming sparsely covered with age, older twigs greyish-white, yellowish-brown to dark brown, fissured. Petiole (2-)3.5-6 mm long, 1-2 mm in diam., densely covered with yellowish fimbriate scales. Lamina narrowly ovate to narrowly elliptic (elliptic), coriaceous, light green to dark green above, pale green below, (8-)10-18(-23) cm long, 3-5.5(-6.5) cm wide, index (2.7-)3-4.5, base acute to slightly attenuate (rounded), apex acuminate to acute, upper side sparsely to rather densely covered with 5-8(-12)-rayed, appressed and/or erect stellate hairs becoming glabrous and slightly shiny with age, lower side densely covered with yellowish fimbriate scales and whitish stellate scales, secondary veins uniformly curved, (10-)13-18(-22) on either side of primary vein, angles with primary vein (45-)50-65(-75), intercostal area irregularly spaced, distance between the middle of closures and the margin 2-5(-7) mm, tertiary veins slightly raised on both sides, irregularly forming (2-)5-12(-15) nets, 4th order veins slightly raised on upper side, slightly raised to flat on lower side.

Inflorescence leaf-opposed or pseudo-terminal, 1-3-flowered, subsessile or on the top of a 2-5 mm long, ligneous rudimentary twig, pedicel (4-)10-25(-30) mm long, straight (recurved), thickened towards flower, 1-2 mm in diam. at base, (1.8-)2-3.5(-4.2) mm in diam. just below flower, fruiting pedicel (12-)15-30 mm long, 2-3(-4) mm in diam. at base, (4.5-)5-7 mm in diam. just below fruit. Bracts 2 to the pedicel, one amplectant on basal 1/2 to 3/4 of pedicel, depressed ovate to subcircular, 5-7 mm in diam., another one broadly triangular, 2-3 mm long, 2.5-3.5 mm wide. Pedicels and outer side of bracts densely covered with yellowish fimbriate scales, inner side densely covered with curviform stellate hairs; outer side of sepals densely covered with yellowish fimbriate scales, inner side (rather densely) densely covered with curviform stellate hairs (basal ca. 1/5 sparsely covered to glabrous); outer side of petals densely covered with yellowish fimbriate to stellate scales, inner side rather densely to densely covered with curviform stellate hairs (basal 1/4 to 1/3 of outer petals and basal 1/3 to 1/2 of inner petals glabrous, striate).

Flower buds broadly ovoid, apex acute to rounded, 5.5-8 mm long, 6-9 mm in diam. Flower yellowish-green, pinkish-red (purple) with dark red inner base. (in vivo). Sepals connate to 1/6-1/4 from base, broadly to very broadly ovate(-deltate), 11-15(-19) mm long, 10-14(-16) mm wide, apex acute (obtuse). Outer petals rhombic-obovate to spathulate (broadly rhombic-obovate), apex acute, at basal 1/4 to 1/3 usually contracted, (15-)18-30(-45) mm long, (8-)10-15(-17) mm wide, inner petals rhombic-obovate (spathulate), apex acute, at basal ca. 1/4 to 1/3 contracted, (18-)20-35(-45) mm long, (8-)12-15(-17) mm wide. Torus very depressed ovoid. Stamens 100-200, 0.9-1.4 mm long, 0.3-0.4 mm wide, apical prolongation of connective (very) shallowly conical, (0.1-)0.2-0.3 mm long, 0.4-0.5 mm wide. Carpels 200-380, stigma and ovary densely covered with curviform and/or erect stellate hairs.

Fruiting receptacle ellipsoid, ca. 18-22 mm long, 10-14 mm in diam. Fruit green with an red centre, broadly ovoid to globose, ca. 4-5 cm in diam., the basal collar composed of 14-20 connate sterile carpels, shallowly conical, ca. 6-11 mm long, 10-20 mm in diam. Fertile carpels 200-350, tetragonous, broadly to transversely rhombic in transverse section, (15-)20-25(-27) mm long, 6-9 mm in diam., top itself flat, with a 1.5-2.5 mm long uncinate tip, densely covered with stellate scales stellate hairs, basal 2/3 to 4/5 of the carpels fused, the upper parts spacing 0-1 mm apart. Seeds filling up 2/3 to 4/5 of the carpel, narrowly ovoid to narrowly ellipsoid (ellipsoid to compressed ellipsoid), 15-22 mm long, 6-8(-10) mm in diam., tawny to dark brown, rugged, usually with 2-3(-4) ribs.

Distribution (Figure 2). Mato Grosso, Rondônia, Goiás, and rarely to S Pará and SW Maranhão. In wet savannas or in gallery forest up to the altitude of 550 m. Flowering and fruiting mainly from June through January.

Specimens examined. Goiás: Serra do Caiapó, 12 km S of Caiapônia, 840 m, 2 May 1973 (st), *W. R. Anderson et al. 9637* (U); Couto de Magalhães, Rio Araguáia, 5 Jul 1953 (fl), *Fróes 30122* (S); Serra do Caiapó, 40 km S of Caiapônia, road to Jatai, 900 m, 26 Jun 1966 (st), *Irwin et al. 17764* (NY); Araguáina, Rio das Lontras, 300 m, 14 Mar 1968 (fr), *Irwin et al. 21192* (NY); km 1-5 of Road from Estreita to Tocantinópolis, 9 Aug 1964 (fl, fr), *Prance & Silva 58630* (B, F, GH, K, MO, NY, RB, S, UC, US); Serra do Caiapó, 66 Km of Jatai, 21 Oct 1964 (fl), *Prance & Silva 59551* (F, GH, K, NY, S, U, US); Ilha do Bananal, 2 km from Macaúba, 18 Sep 1980 (fl, fr), *Ratter et al. 4438* (E, K); Mun. Santa Izabel, Ilha do Bananal, Pargue Nacional do Araguaia, 19 Jun 1979 (st), *F. C. Silva et al. 217* (SP); Rio Araguáia, between Rio Caiepõs and Santana do Araguáia, 12 Aug 1978 (fl, fr), *N. T. Silva 4801* (U). *Maranhão:* Ilha dos Botes, Rio Tocantins, near Carolina, 25 May 1950 (fl), *Pires & Black 2107* (NY, S, U, UC). *Mato Grosso:* Mun. Sinop, Fazenda Missionaría, Rio Teles Pires, 25 Sep 1985 (fl, fr), *Cid et al. 6265* (U); Mun. Santa Terezinha, 21 km S of Santa Terezinha, Serra da Cobrinha, 13 Oct 1985 (fr), *Cid et al. 6439* (U); Aripuanã, near Salto Andorinha, 21 Oct 1976 (fl), *Gomes & Miranda* 356 (INPA); Royal Geographic Society Expedition Base Camp, ca. 12°49' S, 51°46' W, 16 Oct 1968 (fr), *Harley 10665* (K, MO, NY, P, UC); Cáceres, Sep 1908 (fl), *F. C. Hoehne 549* (SP); São Luis de Cáceres, Jun 1911 (fl), *F. C. Hoehne 3461* (SP); São Luis de Cáceres, Jul 1911 (fl), *F. C. Hoehne 3464* (S); Serra do Roncador, 84 km N of Xavantina, 550 m, 1 Jun 1966 (fl, fr), *Irwin et al. 16418* (MO, NY, S, SP); Estrada Ranchão da Lagoa-Engenho Velho (Cuiabá), 22 Nov 1976 (y fr), *M. Macedo et al. 305* (INPA); Cuiabá, 30 Nov 1893 (fl), *Malme 1178** (S); Cuiabá, 17 Jun 1902 (fl), *Malme 1779* (F, G, LE, S); Mun. Santa Terezinha, Rio Araguáia, 10 Oct 1985 (fr), *Pirani et al. 1193* (U); Mun. Luciara, Distr. Porto Alegre, 10-11 km from Highway BR 158, 16 Oct 1985 (fr), *Pirani et al. 1278* (U); Gorge of Veu do Noiva, Chapada dos Guimarães, 17 Oct 1973 (fl), *Prance et al. 19087* (K, MO, NY, S, U); 50 km N of Chavantina, Rio Vau, 8 Oct 1964 (fl), *Prance & Silva 59305* (F, GH, K, NY, S, U, US); 8 km NE of the Base Camp of the Expedition, close to Xavantina-São Felix road, 12 Apr 1968 (st), *Ratter et al. 1019* (K); Fazenda Santa Teresa, Rio Negro area, 29 Apr 1978 (st), *Schaller 153* (NY); Mun. Vila Bela da Santíssima Trindade, 41

km NNW of Potes and Lacerda on BR 364 to Vilhena, 31 Oct 1985 (fr), *Thomas et al. 4712* (U). *Pará:* Mun. Conceição do Araguaia, 20 km W of Redenção, near Córrego São João and Troncamento Santa Teresa, 350-620 m, 8 Feb 1980 (fr), *Plowman et al. 8532* (U) Chapada dos Pareeis, 20 Jan 1985 (fl), *Venturieri & Menezes* 18 (INPA). *Rondônia:* Mun. Presidente Medici, BR 364, km 300 of road from Cuiabá to Porto Velho, 28 Jun 1984 (fl, fr), *Cid et al. 4874* (U); Mun. Ariquemes, Minerção Mibrasa, Setor Alto Candeias, km 128, 19 May 1982 (fl), *Teixeira et al. 612* (U).

Vernacular names. Araticum, Articum, Cunduru, Envira Biriba.

D. marcgraviana has been lectotypied by Fries (1934) with *Riedel 1471*. In Leningrad there were 2 collections of it, one a specimen with a label in *Riedel*'s handwriting ("no. 1471, Anona, Arbor 20-25 ped. Foliis ab squamulis cineras crescentibus florib. flavescentis. In humidis tempore pluv. inundatis pr. Matto Grosso. Febr. 1828") and annotated by Fries (1905) as *Aberemoa marcgraviana*. The second collection has been selected by us as lectotype as it is apparently a duplicate of *Riedel 1471* as it has been annotated by Martius with a.o.: " Duguetia marcgraviana Mart. Icon. nomine Biriba in Libro qui dicitur Principes quem Marcgravii composuit Menzelius, in biblioth. Berol. aspervat. ". This is almost the same phrase as is given in Martius's original description.

D. marcgraviana appears to be a highly variable species, i.e., in the length of the pedicels, leaf size, persistence of the leaf indument, petal length, etc. In all characters, *D. brevipedunculata* R. E. Fries fits in our description of *D. marcgraviana*, with the sole exception of the upper leaf side which is glabrous from the very beginning. This character, however, does not seem to be sufficient to maintain a separate species, in particular as only the type of *D. brevipedunculata* from Santa Anna da Chapada of Mato Grosso is known up to now. Therefore, *D. brevipedunculata* is brought into synonymy with *D. marcgraviana*.

D. marcgraviana can easily be confused with both *D. echinophora* and *D. lepidota*. It comes most close to *D. echinophora*, from which it differs in some features of the leaves, fruit and seeds (Table 2). Vegetatively, *D. lepidota* comes close to *D. marcgraviana* and *D. echinophora*, but its inflorescence may be more-flowered and its fruit is very distinctive (carpels at apical 1/5-1/4 suddenly contracted and forming a black, decayed-ligneous, irregularly rugose peltate top).

5. *Duguetia echinophora* R. E. Fries, Acta Horti Berg. 12(1): 40. 1934. Type: Brazil. Pará: Bragança, 14 Jan 1923 (fl, fr), *Ducke RB17868* (holotype, S; isotypes, B, K, RB , US). Figure 8

Tree (rarely shrub), (3-)5-20(-25) m tall, stems (8-)15-20(-40) cm in diam. Young twigs densely covered with yellowish fimbriate scales, becoming glabrous with age, older twigs greenish-brown to dark brown, striate. Petiole (2.5-)3-4.5(-5) mm long, (1.2-)1.5-1.8 mm in diam., (rather densely) densely covered with yellowish fimbriate scales. Lamina elliptic, oblong-elliptic to narrowly ovate, chartaceous to slightly coriaceous, green to dark green and shiny above, greyish-green to green below, (6-)9-15(-17) cm long, (2.5-)3-5(-6) cm wide, index (2.2-)2.5-3.5(-4), base attenuate, acute to obtuse, apex acuminate (to acute), upper side glabrous from the very beginning (sometimes covered with stellate hairs on the base of primary vein), lower side densely covered with yellowish fimbriate scales and whitish stellate scales, secondary veins uniformly curved, (8-)11-15(-18) on either sides of primary vein, angles with primary vein (45°-)55°-65°(-75°), intercostal area irregularly spaced, distance between the middle of closures and margin (1.5-)2-5(-8) mm, tertiary veins slightly raised on both sides, irregularly forming (2-)5-13(-15) nets, 4th order veins slightly raised on upper side, slightly raised to flat on lower side.

Inflorescence leaf-opposed, 1-2(-3)-flowered, subsessile, pedicels 9-15(-18) mm long, straight (recurved), (1-)1.2-2(-2.5) mm in diam. at base, 2.5-4 mm in diam. just below flower, fruiting pedicel 14-22(-25) mm long, (2-)2.5-4.5(-6) mm in diam. at base, 3-7 mm in diam. just below fruit. Bracts 2 to the pedicel, one amplectant on basal 2/5 to 4/5 of pedicel, depressed ovate, 3-4.5 mm long, 6-7(-8) mm wide, another one broadly ovate to deltate, 2-3 mm long, 3-4 mm wide. Pedicels and outer side of bracts densely covered with yellowish fimbriate scales, inner side of bracts (sparsely to) densely covered with curviform stellate hairs; outer side of sepals densely covered with yellowish fimbriate scales, inner side rather densely covered with curviform stellate hairs (basal ca. 1/5 usually very sparsely covered to glabrous); outer side of petals (rather densely to) densely covered with yellowish fimbriate to stellate scales, inner side densely covered with curviform stellate hairs (basal 1/5 to 2/5 of outer petals and 1/5 to 1/2 of inner petals glabrous, striate).

Flower buds broadly to very broadly ovoid, apex acute (rounded), 5-8 mm long, 5-9 mm in diam. Flower green to greenish-yellow with red inner base (in vivo). Sepals connate to 1/5-1/4 from base, ovate to very broadly

ovate (elliptic to oblong-elliptic), 13-16(-20) mm long, 9-14 mm wide, apex acute. Outer petals (narrowly) obovate to spathulate, apex acute to obtuse, at basal 1/4 to 1/3 strikingly contracted, 15-25 mm long, 8-11 mm wide, inner petals obovate to spathulate, apex acute, at basal 1/3 to 1/2 strikingly contracted, 14-25(-30) mm long, 8-14 mm wide. Torus transversely narrowly ellipsoid. Stamens 200-300, (0.9-)1.1-1.4 mm long, 0.2-0.3 mm in diam., apical prolongation of connective shallowly conical, (0.2-)0.2-0.3 mm long, 0.3-0.5(-0.6) mm wide. Carpels 150-250(-300), stigma densely covered with curviform and/or erect stellate hairs.

Fruiting receptacle subglobose to broadly ellipsoid, 10-18(-20) mm in diam. Fruit red at maturity with an orange edible pulp (in vivo), transversely broadly ellipsoid to subglobose, 3.5-6 cm long, 4.5-7 cm in diam., the basal collar composed of 12-16 connate sterile carpels, very broadly to shallowly conical, 9-14 mm long, 12-16 mm in diam. Fertile carpels 150-250(-280), angular-obovoid to obconical, (18-)20-26 mm long, 7-11 mm in diam., top itself flat to conical, irregularly rugose, with a 2-3 mm long uncinate tip, densely covered with stellate scales and stellate hairs, basal 4/5 of the carpels to totally fused. Seed filling up 3/5 to 3/4 of the carpel, obovoid, (11-)13-18 mm long, 5-7(-9) mm in diam., tawny to dark brown, roughish, usually with 3-4 ribs.

Distribution (Figure 2). Amapá, Amazonas, Maranhão, Pará, and Piauí. In primary or secondary forest. Flowering and fruiting all the year around.

Specimens examined. Amapá: Rio Araguari, 5 Sep 1961 (fl), *Pires et al. 50732* (G, GH, MG, NY, U). *Amazonas:* Colosso, Faz. Esteio, km. 23, ZF-3, 24 Jul 1986 (y fr), *Cardoso & Setz 36* (INPA); Estrada Manaus-Caracaraí, km 57, 15 Sep 1976 (fr), *Damião & Mota 632* (INPA); Manaus, Estrada Manaus-Caracaraí, km 57, 24 Sep 1976 (y fr), *Nascimento 53* (U); Km 69, E of Highway Manaus-Itacoatiara, 5 Oct 1960 (fr), *Rodrigues 1809* (INPA, MG); *Maranhão:* Fazenda Bacaba, 5 km S of MA 119, from entrance 3 km NW of Lago do Junco, 4 Oct 1980 (fr), *Daly et al. 459* (NY, U); 50 km from Santa Luzia on highway to Açailândia, 24 Oct 1980 (fr), *Daly et al. 741* (NY, U); São Luis, Granja Barreto, 25 Oct 1948 (fl), *Ducke 10* (S); Mun. Lorêto, 40 km S of Lorêto, 250 m, 25 Mar 1962 (fr), *Eiten & Eiten 3832* (NY, SP, US); Rio Maracaçumé region, 14 Sep 1932, *Fróes 1905* (A, B, BM, F, G, K, MICH, MO, NY, P, S, U, US); Island of São Luiz, Feb-Mar 1939 (fl), *Fróes 11641* (A, F, G, K, LIL, MICH, MO, NY, S, U, UC, US); São Luiz, 12 May 1949, *Fróes 24246* (SP); Alzilândia, Rio Pindaré, 0-100 m, 12 Dec 1978 (fr), *Jangoux*

& Bahia 438 (NY, U); Bom Passar, 24 km of Peritoró, 6 Jun 1979 (st), *Jangoux & Bahia 1058* (U); Buriticupu, Reserva Florestal da CVRD, 5-30 Sep 1975 (y fr), *N. A. Rosa et al. 5170* (MG); Mun. Tuntum, 5 km N of Palmeirinhas, 25 Feb 1983 (fr), *Schatz et al. 772* (U); Mun. Barra do Corda, Cachoeirinha, 57 km SSW of Barra do Corda, 2 Mar 1983 (fl), *Schatz et al. 827* (U); Mun. Barra do Corda. Cachoerinha, 57 km SSW of Barra do Corda, along Rio Corda, 2 Mar 1983 (fl, fr), *Schatz et al. 835* (U); Mun. Codo, 50 m, 27 Jun 1972 (fl), *Sucre & Silva 9400* (RB, U). *Pará:* Curuça, Iririteua, 14 Dec 1978 (st), *Cavalcante 3359* (NY); Acará, Fazenda Borba Gato, near Rio Acará, 7 Nov 1980 (st), *Daly et al. 873* (F, MICH, NY, U); km 90 of Highway from Belém to Brasília, 21 Sep 1959 (fl, fr), *M. Kuhlmann & Jimbo 257* (SP, US); Curuçá, 4-10 Nov 1985 (fr), *Lobato et al. 141* (MG); 50-60 km N of Gurupi, Belém-Brasília Highway, 12 Aug 1964 (fr), *Prance & Silva 58684* (F, GH, K, NY, S, U); Vicinity of Paragominas, km 161 of Belém-Brasília Highway, 28 Aug 1964 (fl), *Prance & Silva 58931* (F, GH, NY, S, U); Ilha de Marajó, Mun. Salvaterra, Joanes, 25 Apr 1980. *N. A. Rosa 3638* (U); Ilha de Marajó, Mun. Salvaterra, Joanes, 10 Jan 1982 (fl), *Rosário & Taylor 116* (HBG, MG). *Piauí:* E of Piauí, Mun. Cocal. 110 m, 21 Jun 1972 (fl), *Sucre et al. 9247* (RB).

Vernacular names. Ameiju, Ameju de touceira, Ata braba / Ata brava, Ata-meju (= Envira surucucu), Envira-preta, Envira surucucu, Envireira, Pindacua.

Uses. Wood of this species is used for frame building. The bark is used as cure for fever. The orange flesh of the mature fruit is edible.

For discussion of the differences between *D. echinophora*, *D.lepidota* and *D. marcgraviana*, see note under description of *D. marcgraviana*.

6. *Duguetia lepidota* (Miquel) Pulle, Enum. Vasc. Pl. Surinam 176. 1906; R. E. Fries, Acta Horti Berg. 12(1): 41. 1934. Figure 9

Annona lepidota Miquel. Linnaea 19: 129. 1847. Type: Surinam. Surinam River ("in regionibus interioribus ad fl. Surinam"), Oct 1844 (fl), *Kappler 1686* (holotype. U: isotypes, B, F: fragment, G, P, S).

Aberemoa lepidota (Miquel) R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl., n.s., 34(5): 20. 1900.

Tree (or rarely shrub), (7-)10-20(-28) m tall, stems (6-)15-25(-65) cm in diam. Young twigs densely covered with yellowish fimbriate scales, becoming

glabrous with age, older twigs greyish-brown to dark brown, irregularly striate. Petiole 4-6(-8) mm long, (1-)1.5-2(-2.5) mm in diam., densely covered with yellowish fimbriate scales. Lamina narrowly ovate to narrowly elliptic-ovate (narrowly elliptic), chartaceous to slightly coriaceous, dark green and slightly shiny above, greyish-green below, (7-)9-20(-23) cm long, (2.2-)3-5(-6.2) cm wide, index 3-4(-4.3), base acute, narrowly cuneate to slightly attenuate, apex acuminate to acute, upper side sparsely to rather densely covered with whitish (yellowish), (5-)6-10(-12)-rayed appressed and/or erect stellate hairs becoming sparsely covered to glabrous with age, lower side densely covered with yellowish fimbriate scales and stellate scales, secondary veins uniformly curved, (9-)12-18 on either side of primary vein, angles with primary veins (50°-)60°-70°(-80°), intercostal area irregularly spaced, distance between the middle of closures and margin (1-)2-5(-6) mm, tertiary veins slightly raised on both sides, irregularly forming 2-13 nets, 4th order veins slightly raised to flat on both sides, but nearly invisible on lower side because of the dense indument.

Inflorescence leaf-opposed or pseudo-terminal, ramose, 1-9(-12)-flowered, subsessile or on the top of a 2-4 mm long, ligneous rudimentary twig, pedicel (11-)15-18(-22) mm long, straight, (0.8-)1-1.2 mm in diam. at base, (1.5-)2-3(-4) mm in diam. just below flower, fruiting pedicel (20-)25-35 mm long, (2-)3-5(-6) mm in diam. at base, (4-)5-8(-9) mm in diam. just below fruit. Bracts 2 to the pedicel, one amplectant on basal 1/2(-3/4) of pedicel, depressed ovate to very broadly ovate (subcircular), 2.5-4.5 mm long, 4-6 mm wide, another one depressed ovate to broadly ovate (to deltate), 1-2.5 mm long, 2-4 mm wide. Pedicels and outer side of bracts rather densely to densely covered with yellowish fimbriate scales, inner side of bracts (rather densely to) densely covered with curviform stellate hairs; outer side of sepals rather densely to densely covered with yellowish fimbriate scales, inner side densely covered with curviform stellate hairs (basal ca. 1/5 usually very sparsely covered to glabrous); outer side of petals densely covered with yellowish fimbriate to stellate scales (stellate hairs), inner side densely covered with curviform stellate hairs (basal 1/3-1/2 of outer petals and basal 1/2-2/3 of inner petals glabrous, striate).

Flower buds broadly to very broadly ovoid, apex acute (rounded), (4-)6-8 mm long, (4.5-)5.5-8 mm in diam. Flower green to greenish-yellow, with pink to dark red inner base (in vivo). Sepals connate to 1/6-1/4 from base, ovate to broadly ovate, 9-13 mm long, 8-13 mm wide. Outer petals obovate to slightly

spathulate, apex acute, at basal 1/3-1/2 strikingly contracted, (10-)12-20(-22) mm long, (6-)7-10(-12) mm wide, inner petals obovate to slightly spathulate, apex acute to obtuse, at basal 1/3-1/2 apparently contracted, (10-)14-20(-28) mm long, (6-)8-10(-12) mm wide. Torus transversely narrowly ellipsoid. Stamens 120-250, (1.2-)1.4-1.5(-1.7) mm long, (0.3-)0.4-0.5 mm wide, apical prolongation of connective shallowly (to very shallowly) conical, (0.2-)0.3-0.4 mm long, (0.4-)0.5-0.6(-0.7) mm wide. Carpels 150-300(-480), stigma and ovary sparsely to densely covered with curviform stellate hairs.

Fruiting receptacle ellipsoid, ca. 30-35 mm long, 20-25(-30) mm in diam. Fruit green when immature, outer surface becoming pink and the centre becoming orange with age (in vivo), ovoid to very broadly ovoid (to spheroid), 5.5-8 cm long, 5.5-7 cm in diam., the basal collar composed of 12-15 connate sterile carpels, broadly conical to deltoid, ca. 14-18 mm long, 14-16 mm in diam., fertile carpels 150-350(-450), narrowly angular-obovoid to angular-obovoid, (15-)20-28 mm long, (6-)8-12 mm in diam., at apical 1/5-1/4 suddenly contracted and forming a black, decayed-ligneous, irregularly rugose and peltate top, basal 2/3 to 3/4 of the carpels fused, the upper parts spacing 1-5 mm apart. Seed filling up 2/3 to 3/4 of the carpel, ellipsoid (obovoid), (10-)12-16(-18) mm long, (5-)6-8 mm in diam., tawny to dark brown, roughish (smooth).

Distribution (Figure 2). Colombia, Venezuela, Surinam and the Brazilian states of Amazonas, Pará and Maranhão. Mostly in primary forest on terra firma. Flowering and fruiting all the year around.

Specimens examined. Amazonas: Mun. Barcelos, 3 km S of Serra Central of Serra Araeá, 8 km E of Rio Javari, 9 Mar 1984 (fr), *Amaral et al. 1702* (U). *Maranhão:* Mun. Santa Luzia, Fazenda AGRIPEC, 7 km W of Buriticupu, 3 Apr 1983 (fr), *Taylor et al. E1129* (U). *Pará:* 18 km from Tucuruí, 16 km S on old Highway BR 422, 1 Nov 1981 (fl), *Daly et al. 1155* (U); 25 km from Tucuruí, SW of new road serving Fazendas, 14 Nov 1981 (fl, Y fr), *Daly et al. 1323* (U); Breu Branco, 40 km S of Tucurui, then 5 km W on old logging road, 22 Nov 1981 (fl), *Daly et al. 1535* (NY, U); Rio Tocantins, Jacundá, Rio Cajazeiras, 16 May 1978 (fl), *M. G. Silva & Bahia 3603* (NY); Tucuruí, BR230, 5 Nov 1979 (fr), *M. F. F. Silva et al. 39* (HBG). *Roraima:* Mun. Alto Alegre, Ilha de Maracá, SEMA Ecological Station, 4 Jun 1986 (fr), *Hopkins et al. 507* (U); Mun. Alto Alegre, Ilha de Maracá, 6 Jun 1986 (fr), *Hopkins et al. 512* (U); Canto Galo, Rio Mucajaí between Pratinha and Rio Apiaú, 21 Jan 1967 (fr), *Prance et al. 3961* (F, GH, K, NY, S, U, US); Ipiranga, Rio Mucajaí,

between Pratinha and Rio Apiaú, 27 Jan 1967 (fr), *Prance et al. 4130* (F, K, NY, S, U, US); Base of Serra Tepequem, 11 Feb 1967 (fl), *Prance et al. 4327* (F, GH, K, NY, S, U, US); Ilha de Maracá, SEMA Ecological Station, 29 Oct 1987 (y fr), *Ratter & Milliken 5916* (U); Ilha de Maracá, SEMA Ecological Station, 15 Feb 1979 (fr), *W. Rodrigues 10144* (MO); near Ecological Station of Ilha de Maracá, 6 Feb 1979 (fr), *N. A. Rosa 3058* (NY, U).

Vernacular names. Ameiju, Ata braba.

Uses. The wood is used for construction.

Vegetatively *D. lepidota* comes close to *D. marcgraviana* and *D. echinophora* (see discussion under *D. marcgraviana*), but its fruit is very distinctive as the upper 1/5-1/4 part of the carpels is suddenly contracted forming a black, decayed-ligneous, irregularly-rugose peltate top.

7. *Duguetia glabriuscula* (R. E. Fries) R. E. Fries, Acta Horti Berg. 12 (1): 46. 1934. Figure 10

Aberemoa lanceolata (A. F. C. P. de Saint-Hilaire) Warming var. *glabriuscula* R. E. Fries, Ark. Bot. 4 (19): 6. 1905. Type: Brazil. Mato Grosso: between Buriti and Santa Anna da Chapada, 4 Oct 1902 (fl), *Malme II-2440* (holotype and isotype, S).

Shrub, 0.3-2 m tall. Young twigs sparsely to densely covered with whitish fimbriate scales, becoming glabrous with age, older twigs dark brown, irregularly striate. Petiole 2.5-4 mm long, 1.5-2 mm in diam., sparsely to rather densely covered with whitish stellate scales. Lamina elliptic to ovate, coriaceous, green on both sides, 6-10 cm long, index 1.6-2(-2.3), base acute to obtuse(-attenuate), apex obtuse(-rounded or acute), upper side glabrous, lower side sparsely covered with whitish stellate scales, secondary veins abruptly curved, 8-12 on either sides of primary vein, angles with primary veins (45°-)50°-65°(-75°), intercostal area irregularly spaced, distance between the middle of closure and margin 2-4 mm, tertiary veins conspicuous, raised on both sides, irregularly forming 7-10 nets, 4th order veins subconspicuous, slightly raised on both sides.

Inflorescence leaf-opposed, 1-2-flowered, subsessile, pedicel 6-8(-10) mm long, recurved, 0.6-1 mm in diam. at base, 1-2 mm in diam. just below flower. Bracts 2; one amplectant on basal 1/3-2/3 of pedicel, very broadly ovate, 1.5-2.5 mm long, 2.5-3.5 mm wide, another one broadly to very broadly triangular,

1.5-2 mm long, 1.5-2 mm wide. Pedicels and outer side of bracts densely covered with whitish fimbriate scales, inner side of bracts glabrous (or rarely sparsely covered with stellate hairs); outer side of sepals densely covered with whitish fimbriate scales, inner side densely covered with whitish curviform stellate hairs (basal 1/3-1/2 sparsely covered to glabrous); outer side of petals densely covered with whitish stellate scales, inner side densely covered with whitish curviform to erect stellate hairs (basal 1/6-1/5 of outer petals and 1/5-1/4 of inner petals sparsely covered to glabrous).

Flower buds ovoid to broadly ovoid, apex acute to obtuse, 4-8 mm long, 4-6.5 mm in diam. Flower green to greenish salmon, with red at inner base (in vivo). Sepals connate to 1/6-1/5 from base, triangular-ovate to broadly ovate, 9-12 mm long, 6-9 mm wide. Outer petals rhombic-elliptic, apex acute, 15-22 mm long, 7-11 mm wide, inner petals rhombic-elliptic, apex acute, 14-20 mm long, 7-10 mm wide. Torus depressed ovoid. Stamens 80-150, 0.8-1 mm long, 0.4-0.6 mm wide, apical prolongation of connective very shallowly conical, puberulous, 0.2-0.3 mm long, 0.5-0.7 mm wide. Carpels 50-130, ovary glabrous, upper part of stigma densely covered with whitish erect stellate hairs.

Fruiting receptacle ellipsoid to oblong-ellipsoid, 13-16 mm long, 9-12 mm in diam. Fruit subglobose, 3-4 cm in diam., the basal collar composed of 8-10 connate sterile carpels, angular-ovoid or conical, 8-10 mm long, 8-10 mm in diam., glabrous, fertile carpels 60-120, obtrulloid, 12-15 mm long, 7-10 mm in diam., with 4-5(-7) ribs, top itself shallowly conical, uncinate, glabrous, totally free from each other. Seeds not seen.

Distribution (Figure 3). Brazil: Mato Grosso and Bolivia: Santa Cruz. In cerrado and Pantanal vegetation. Flowering mainly from September to November, and fruiting from November to March.

Specimens examined. Mato Grosso: Torixoréu, *J. S. Costa 75* (RB); Mt. Chapada dos Guimarães, 3 Mar 1983 (y fr), *da Cunha et al. 788* (MG); 50 km N of Barra do Garças, on road to Xavantina, 300-400 m, 14 Oct 1964 (fl), *Irwin & Soderstrom 6870* (NY, S); 12 km of Chapada dos Guimarães, E of Cuiabá, 630 m, 21 Mar 1981 (y fr), *Jangoux & Sebastião 1403* (MG); Fazenda Miranda, near Rio Aquidauana, 18 Sep 1980 (fl), *Pires & Furtado 17164* (U); Chapada dos Guimarães, próxime a Escola Evangélica de Buriti, 21 Nov 1982 (y fl), *J. U. Santos & Rosário 392* (MG); Chapada dos Guimarães, próximo a Escola Evangélica de Buriti, 21 Nov 1982 (fr), *J. U. Santos & Rosário 406* (MG).

The shape and venation of the mature leaves of this species most resemble that of *D. moricandiana*. Differences are found in the puberulous apical prolongation of the connectives, and the glabrous ovary (vs. glabrous apical prolongation of connective and densely hairy ovary in *D. moricandiana*).

D. glabriuscula is also very close to *D. lanceolata*. It can be distinguished by its mature lamina acute to obtuse at the base, and obtuse to rounded at the apex (vs. narrowly cuneate to attenuate at the base, and acute to acuminate at the apex in *D. lanceolata*).

8. *Duguetia lanceolata* A. F. C. P. de Saint-Hilaire, Fl. Bras. merid. 1: 35. t. 7. 1825; R. E. Fries, Acta Horti Berg. 12 (1): 47. 1934. Type: Brazil. Minas Gerais: Sumidouro, near Villa do Principe, (fr), *A. F. C. P. de Saint-Hilaire s.n.* (holotype & isotype, P). Figure 11

Aberemoa lanceolata (A. F. C. P. de Saint-Hilaire) Warming, Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn 1873: 146. 1873.

Duguetia lanceolata A. F. C. P. de Saint-Hilaire var. *parvifolia* (R. E. Fries) R. E. Fries, Acta Horti Berg. 12(1): 47. 1934.

Aberemoa lanceolata (A. F. C. P. de Saint-Hilaire) Warming var. *parvifolia* R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl. n.s. 34(5): 20. 1900. Type: Brazil. Rio de Janeiro: Petropolis, Santo Antonio, 25 Sep 1875 (fl), *Glaziou 8255* (syntypes, B, C, G, K, LE).

Tree (rarely shrub), (2.5-)8-18 m tall, ca. 25 cm in diam. Young twigs rather densely to densely covered with yellowish fimbriate to stellate scales, becoming sparsely covered or glabrous with age, older twigs yellowish-brown to greyish white, irregularly striate. Petiole 2-5 mm long, 1-2 mm in diam., densely covered with yellowish to whitish fimbriate to stellate scales. Lamina narrowly elliptic to elliptic (ovate-elliptic or oblong-elliptic), coriaceous, green above, green to greenish yellow below, (4-)6-10(-14) cm long, (1.5-)2.5-4(-5.5) cm wide, index 1.9-3, base narrowly cuneate to attenuate, apex acute to acuminate, upper side glabrous, slightly shiny, lower side (sparsely) rather densely covered with whitish (fimbriate to) stellate scales, secondary veins uniformly curved, (8-)10-15 on either sides of primary vein, angles with primary veins (45°-)50°-70°(-80°), intercostal area irregularly (or somewhat regularly) spaced. distance between the middle of closure and the margin 2-4 mm, tertiary veins raised on both sides, irregularly forming 5-10(-13) nets, 4th order veins slightly raised on both sides.

Infloreseenee leaf-opposed or supra-axillary, 1-3(-4)-flowered, subsessile, pedieel (5-)10-20 mm long, 0.8-1.2 mm in diam. at base, 1.5-2.5 mm in diam. just below flower, fruiting pedieel (11-)15-20(-22) mm long, 2-4 mm in diam. at base, 3.5-4.5(-6) mm in diam. just below the fruit. Braets 2 to the pedieel, one ampleetant on basal 2/3-5/6 of pedieel, very broadly to depressed ovate, 2-4 mm long, 4-6 mm wide, easily broken, another one deltate to very broadly ovate, 1.5-2.5 mm long, 2.5-3.5 mm wide. Pedieels and outer side of braets, densely eovered with yellowish fimbriate to stellate seales inner side of braets glabrous (or rarely sparsely eovered with stellate hairs); outer side of sepals densely eovered with yellowish fimbriate to stellate seales, inner side densely eovered with eurviform stellate hairs (basal 1/5 usually sparsely eovered); outer side of petals densely eovered with yellowish to whitish stellate seales to stellate hairs, inner side densely eovered with yellowish to whitish eurviform stellate hairs (basal 1/10 of outer petals and 1/5-1/4 of inner petals glabrous).

Flower buds broadly to very broadly ovoid, apex aeute (to obtuse), 3.5-6 mm long, 3-6 mm in diam. Flower green, brownish pink to red, with dark red at inner base (in vivo). Sepals eonnate to 1/6-1/5 from base, triangular-ovate (broadly triangular-ovate), 9-11 mm long, 6-8 mm wide. Outer petals rhombie-elliptie to narrowly ovate(-spathulate), apex aeute to obtuse, 14-20 mm long, 5-9 mm wide, inner petals rhombie-elliptie to spathulate, apex aeute(-obtuse), 15-20 mm long, 6-9 mm wide. Torus depressed ovoid, densely eovered with whitish ereet stellate hairs. Stamens 80-150, 1.1-1.3 mm long, 0.5-0.7 mm wide, apieal prolongation of eonneetive shallowly to very shallowly eonieal, eompressed, setulose, 0.2-0.4 mm long, 0.6-0.8 mm wide. Carpels 40-100, ovary glabrous, upper part of stigma sparsely to densely eovered with ereet stellate hairs.

Fruiting reeeptaele ellipsoid to broadly ellipsoid (or oblong-ellipsoid) or obovoid, 15-30 mm long, 15-21 mm in diam. Fruit green to red, subglobose, 4-6 em in diam., the basal eollar eomposed of 7-14 eonnate sterile earpels, oblong-ellipsoid or broadly angular-ovoid, 8-17 mm long, 8-18 mm in diam., glabrous, fertile earpels 30-80, obtrulloid, 20-25 mm long, 10-13 mm in diam., with 5-7 ribs, top itself shallowly eonieal, glabrous, totally free from eaeh other. Seed filling up 5/6 of the earpel, obovoid, 18-22 mm long, 8-10 mm in diam., yellowish-brown, rugged.

Distribution (Figure 3). The Brazilian states of Minas Gerais, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, and São Paulo. In eerrado or in semideeidous forest from nearly sea level up to 900 m at elevation. Flowering mainly from September to Mareh, and fruiting mainly from Oetober to May.

Specimens examined. Minas Gerais: São Sebestião da Campina, 22 Dec 1949 (y fr), *Duarte 2289* (RB); Pindai- reuna, near Felixlândia, 20 Jul 1959 (fl), *A. de Mattos 121* (RB); " In circuitu urbis Franca", 1902 (fr), *Wacket s.n.* (W); Lagoa Santa, 8 Mar 1865 (fl, fr), *Warming s.n.* (C, F, K, NY, S). *Paraná:* Sangés, 29 Jun 1910 (y fl), *Dusén 9939* (GH, NY, S); Patrimonio, 900 m, 11 Mar 1915 (st), *Dusén 16785* (GH, MO). *Rio de Janeiro:* Ypanema, Jan 1826 (y fr), *Riedel 174* (BM, LE, M, S); Itaipava, 1940 (fl), *Stickney RB42422* (RB). *Rio Grande do Sul:* Torres, Limoeiro, 21 Apr 1978 (fr), *Waechter & Baptista ICN826* (ICN); Torres, Lageadi, 18 Oct 1980 (fl), *Waechter ICN1735* (ICN); Três Cachoeiras, Pôrto Alegre, 26 Mar 1977 (yfl), *Waechter ICN42185* (F); Torres, Três Cachoeiras, Sep 1978 (fl) *Waechter & Baptista ICN47652* (ICN). *Santa Catarina:* Reserva Florestal des Pilões, 250 m, 3 Dec 1950 (fl), *Duarte & Frazão 3208* (BM, F, M, NY, RB, Z); Brusque, near Azambuja, 50 m, 25 Nov 1949 (fl), *Klein 182* (NY, S, US); Morro da Fazenda, Itajaí, 200 m, 30 Nov 1954 (fl), *Klein 886* (B, NY, S, UC, US); Horto Florestal I.N.P., Ibirama, 200 m, 27 Dec 1954 (fl), *Klein 936* (B, NY, P, S, US); Mun. Matador, Matador, 300 m, 17 Dec 1967 (fl), *Lourteig 2312* (C, P); Horto Florestal I.N.P., Ibirama, 300 m, 2 Mar 1954 (fr), *Reitz & Klein 1647* (NY, S, UC); Pilões, Palhoça, 250 m, 5 Apr 1956 (fr), *Reitz & Klein 3044* (B, GH, NY, S, U, UC, WIS); Azambuja, Brusque, 50 m, 15 Nov 1949 (st), *Reitz 3204* (S); Azambuja, Brusque, 50 m, 15 Nov 1949 (fl), *Reitz 3585* (B, F, G, NY, P, U, UC, W); Ibirama, 100 m, 21 Sep 1956 (fl), *Reitz & Klein 3750* (S); Matador, Rio do Sul, 350 m, 18 Oct 1958 (fl), *Reitz & Klein 7342* (G, M, S, Z); Vargem Grande, Lauro Müller, 350 m, 24 Oct 1958 (fl), *Reitz & Klein 7483* (B, K, S); Pirão Frio, Sombrio, 10 m, 29 Oct 1959 (fl), *Reitz & Klein 9248* (B, G, K, M, S, Z); Itajaí, 11 Nov 1953 (fl), *Schultz 1103* (ICN). *São Paulo:* Mun. Anhembi, Barreiro Rico, 19 Sep 1979 (fl), *Assumpcão 7548* (E); Paccas, Oct 1945 (fl), *Edwall 145* (S); Jardim Botânico, 26 Sep 1932 (fl), *Hoehne SP29784* (NY); São Paulo, 5 Nov 1937 (fl), *Hoehne SP38975* (SP, U, US); Jardinopolis, margins of Rio Pardo, Parque Rio Pardo, 19 Nov 1947 (y fr), *M. Kuhlmann 1589* (SP); Bairro das Três Fazendas, Fazenda Santa Tereza, 15 Nov 1947 (y fr), *M. Kuhlmann & Gonçalves 1667* (SP); Anhembi, Fazenda Barreiro Rico, 4 Oct 1956 (fl), *M. Kuhlmann 3951* (K, SP, US); Mun. Teodoro Sampaio, Reserva Morro do Diabo, 23 May 1986 (fr), *Leite & Klein 58* (RB); Campo Pasto, São José dos Campos, 12 Mar 1909 (y fl), *Loefgren 244* (RB, S); São José dos Campos, 24 Sep 1909 (fl), *Loefgren 4008* (S); Queluz Sorocabana, 25 Jun 1899 (st), *Loefgren 5986* (S); Pindorama, property of F. Santos, 14 Mar 1939 (fl), *Mendes SP44191* (SP); Campinas, *Novaes 4576* (S); " Interior do Estado de São Paulo", 18 Mar 1932 (fl), *A. Pereira SP29284* (SP, US);

Mugi, Nov 1833 (y fr), *Riedel 1686* (K, LE, S); Loreto, *Unknown collector SP30620* (SP); Campinas, 10 Oct 1938 (y fr), *Valentin 3401* (LIL).

Vernacular names. Cabreuva vermelho, Pindabuna, Pindahiba, Pindaiba/ Pindaíba, Pindaibuna, Pindaúva.

This species resembles most *D. lucida*, a species also placed in Sect. *Duguetia* by Fries, but excluded from this treatment because of its distribution (Trinidad, Venezuela, Guyana and the Brazilian state of Acre). The species differ in the size of the lamina: usually no more than 10 cm long vs. lamina usually more than 10 cm long, and in the indument of ovary and carpel: essentially glabrous vs. sparsely covered with stellate hairs at upper part in *D. lucida*). See also under *D. glabriuscula*.

9. *Duguetia riedeliana* R. E. Fries, Bull. Herb. Boissier sér. 2. 7: 1002. 1907; R. E. Fries, Acta Horti Berg. 12(1): 45. 1934. Type. Brazil. Rio de Janeiro: without exact location, 1836 (fr), *Riedel s.n.* (lectotype, S: designated by Fries, 1934; isolectotype, LE). Figure12

Tree or shrub, (0.5-)4-8(-25) m tall. Young twigs sparsely to densely covered with yellowish stellate scales, becoming glabrous with age, older twigs greyish white to yellowish-brown, irregularly striate. Petiole 3-5 mm long, 0.8-1.2 mm in diam., sparsely covered with fimbriate to stellate scales. Lamina narrowly ovate to ovate (narrowly oblong-elliptic to oblong-elliptic), chartaceous to slightly coriaceous, green on both sides, (4-)5-10(-12) cm long, 2.5-4(-4.5) cm wide, index 2-3(-3.5), base attenuate, apex acuminate(-acute), upper side glabrous, lower side sparsely covered with yellowish stellate scales, secondary veins abruptly curved, 12-16 on either sides of primary vein, angles with primary veins (50°-)60°-75°(-85°), intercostal area somewhat regularly spaced, distance between the middle of closure and margin 3-5 mm, tertiary veins raised on both sides, irregularly forming 7-15 nets, 4th order veins slightly raised to flat on upper side, slightly raised on lower side.

Inflorescence leaf-opposed, 1-2-flowered, subsessile, pedicel 4-6 mm long, straight(-recurved), 0.8-1 mm in diam. at base, 1-1.5 mm in diam. just below the flower, fruiting pedicel 10-20 mm long, 1.5-5 mm in diam. at base, 2.5-6 mm in diam. just below the fruit. Bracts 2 to the pedicel, one amplectant on basal 1/2-2/3 of pedicel, very broadly ovate, 1-2 mm long, 1-2 mm wide, another one shallowly triangular, ca. 1 mm long, 1.5-2 mm wide. Pedicels and outer side of bracts densely covered with yellowish fimbriate to stellate scales,

inner side of bracts glabrous; outer side of sepals densely covered with yellowish fimbriate to stellate scales, inner side densely covered with yellowish curviform stellate hairs (basal ca. 1/6 sparsely covered); outer side of petals densely covered with yellowish stellate scales, inner side sparsely covered with curviform to erect stellate hairs (basal 1/6-1/4 of outer petals and 1/5-1/4 of inner petals nearly glabrous).

Flower buds broadly ovoid, apex acute to apiculate, 4-9 mm long, 5-7 mm in diam. Flower cream-coloured, with dark red inner base (in vivo). Sepals connate to ca. 1/5 from base, triangular ovate to ovate, 10-12 mm long, 6-7.5 mm wide. Outer petals rhombic-elliptic to rhombic-obovate, apex acute, 14-18 mm long, 6-9 mm wide, inner petals rhombic-elliptic (to rhombic-obovate), apex acute, 14-17 mm long, 6-8 mm wide. Torus depressed ovoid, densely covered with yellowish erect stellate hairs. Stamens 60-100, 0.7-1 mm long, 0.3-0.4 mm wide, apical prolongation of connective very shallowly conical, puberulous, 0.1-0.2 mm long, 0.5-0.6 mm wide. Carpels 50-100, ovary and base of style densely covered with yellowish erect stellate hairs, upper part of style glabrous.

Fruit ellipsoid, ca. 7 cm long, 5 cm in diam., the basal collar composed of 10-14 connate sterile carpels, broadly conical to deltoid, 8-14 mm long, 10-15 mm in diam., densely covered with yellowish stellate scales and stellate hairs, fertile carpels 40-100, narrowly angular-obovoid to angular-obovoid, with 4-6 ribs, 15-20 mm long, 9-12 mm in diam., top conical or uncinate, densely covered with yellowish stellate scales and stellate hairs, basal 1/2-3/5 of carpel fused. Seed filling up 5/6-4/5 of the carpel, (broadly) obovoid, compressed, apex apiculate, 10-14 mm long, 8-10 mm in diam., dark brown, smooth.

Distribution (Figure 3). Brazilian states of Bahia, Ceará, Maranhão, and Rio de Janeiro. Flowering mainly from November to June, fruiting in April.

Specimens examined. Bahia: Mun. Uruçuca, 30 km from Uruçuca, 15 Apr 1978 (fr), *Mori & Kallunki 9920* (CEPEC, U). *Ceará:* Serra do Bezouro, 23 Jan 1958 (fl), *T. N. Guedes 484* (MG). *Maranhão:* 10 km W from Barreirinhas road to Sobradinho, 30 Nov 1985 (y fl), *Prance 29924* (U). *Rio de Janeiro:* Mun. Cabo Frio, Búzios, near Praia Brava, 14 Feb 1985 (fl), *Araujo & Plowman 6680* (U); Rio Comprido, Lagoinha, 18 Feb 1871 (st), *Glaziou 4746* (C, P); without exact location, *Glaziou 6464* (C, P); without

exact location, *Glazion 10230* (B, C, K, P); Gávea, Chácara do Lage, 6 Jun 1940 (fl), *J. G. Kuhlmann 6037* (RB, U); Fundão, 8 Mar 1965 (fl), *Lobão & Almir RB194252* (RB, U).

This species is very similar to *D. salicifolia*. Vegetatively it can be recognized by its ovate lamina vs. ellipsoid lamina in *D. salicifolia*), the lower side sparsely covered with stellate scales (0-1 /mm2, 0.1-0.2 mm in diam.) vs. lower side more densely covered with fimbriate scales (3-11 scales/mm2, 0.3-0.4 mm in diam.) in *D. salicifolia* (Table 3).

D. microphylla, a species with the same distribution area and often confused, has much narrower leaves with 3-9 scales per mm2. Furthermore, the apices of the fertile blackened, broadly obconical carpels of *D. microphylla* are truncate and sparsely covered with stellate scales, whereas in *D. riedeliana* one finds carpels with conical or uncinate apices, densely covered with yellowish stellate scales and stellate hairs.

10. *Duguetia microphylla* (R. E. Fries) R. E. Fries, Acta Horti Berg. 6(6): 16. 1919; R. E. Fries, Acta Horti Berg. 12(1): 44. 1934. Figure 13

Aberemoa microphylla R. E. Fries, Kongl. Svenska Vetenskapsakad. Handl. n.s. 34(5): 23. t. 3, f. 4-6. 1900. Type. Brazil. Rio de Janeiro: Serra do Alto Macahé, Novo Friburgo, 1888 (fl, fr), *Glazion 16689* (holotype, B; isotypes, C, F: fragment, S: fragment).

Tree, 5-22 m tall. Young twigs slender, somewhat regularly striate, densely covered with yellowish fimbriate scales, becoming glabrous with age, older twigs greyish white to yellowish-brown, irregularly fissured. Petiole 2-3(-4) mm long, 0.8-1(-1.2) mm in diam., densely covered with yellowish fimbriate scales. Lamina narrowly ovate, chartaceous, greenish on both sides, 6-12 cm long, (1.2-)1.4-2 cm wide, index 4.5-6(-6.4), base attenuate, apex acuminate, upper side glabrous, lower side sparsely to rather densely covered with yellowish fimbriate to stellate scales, secondary veins (uniformly) abruptly curved, 14-18(-20) on either sides of primary vein, angles with primary veins (50°-)55°-70°(-85°), intercostal area irregularly spaced, distance between the middle of closure and margin 2-3 mm, tertiary veins slightly raised on both sides, irregularly forming 5-12 nets, 4th order veins slightly raised to flat on both sides.

Inflorescence leaf-opposed, 1-2-flowered, subsessile, pedicel 6-8 mm long, straight, 0.8-1 mm in diam. at base, 1.2-1.5 mm in diam. just below flower,

fruiting pedicel 10-35 mm long, 2.5-4 mm in diam. at base, 4-7 mm in diam. just below the fruit. Bracts 2 to the pedicel, one amplectant on basal 1/3-1/2 of pedicel, very broadly triangular-ovate, 0.5-1 mm long, 1-1.5 mm wide, another one broadly to very broadly triangular, ca. 0.5 mm long, 0.5-0.8 mm wide, caducous. Pedicels and outer side of bracts densely covered with yellowish fimbriate(-stellate) scales, inner side of bracts glabrous or sparsely covered with stellate hairs; outer side of sepals densely covered with yellowish fimbriate(-stellate) scales, inner side densely covered with yellowish curviform stellate hairs (basal ca. 1/5 usually sparsely covered); outer side of petals densely covered with yellowish stellate scales and stellate hairs, inner side densely covered with yellowish to whitish curviform stellate hairs (basal 1/61/5 of outer petals and 1/5-1/4 of inner petals sparsely covered to glabrous).

Flower buds broadly ovoid, apex acute, 3-7 mm long, 3-6.5 mm in diam. Flower cream, with dark red at inner base (in vivo). Sepals connate to 1/6-1/5 from base, broadly triangular-ovate to broadly elliptic-ovate, apex acute, 6-10 mm long, 5-8 mm wide. Outer petals rhombic-obovate to oblong-rhombic, apex acute, 12-18 mm long, 6-8 mm wide, inner petals rhombic-obovate to oblong-rhombic, apex acute, 11-17 mm long, 6-8 mm wide. Torus depressed ovoid, glabrous. Stamens 100-180, 0.8-1.2 mm long, 0.3-0.4 mm wide, apical prolongation of connective deltoid to shallowly conical, glabrous, 0.4-0.6 mm long, 0.5-0.7 mm wide. Carpels 60-100, ovary and base of style densely covered with whitish stellate scales and stellate hairs, upper part of style glabrous, blackened.

Fruit spheroid, 4-5 cm in diam., the basal collar composed of 8-10 connate sterile carpels, very broadly conical, 8-10 mm long, 12-14 mm in diam., sparsely to densely covered with yellowish stellate scales and stellate hairs, fertile carpels ca. 40, broadly obconical, pentagonous, 15-20 mm long, 13-15 mm in diam., top truncate, blackened, sparsely covered with yellowish stellate scales, basal 4/5 of carpel fused. Seed filling up 3/5-3/4 of the carpel, obovoid(to broadly obovoid), 9-12 mm long, 7-9 mm in diam., dark brown, smooth, slightly shiny.

Distribution (Figure 2). Only known from the state of Rio de Janeiro, Brazil. Flowering from September to November, and fruiting in April.

Specimens examined. Rio de Janeiro: Mun. Macaé, Pico do Frade de Macaé, 900-1000 m, 22 Oct 1985 (fl), *Leitmann et al. 17* (U); Mun. Macaé, Pico do Frade de Macaé, 700-900 m, 18 Apr 1985 (fr), *Martinelli et al. 10734*

(U); Mun. Novo Friburgo, Macaé de Cima, 1100 m, 26 Nov 1986 (fl), *Martinelli et al. 11934* (U); Petrópolis, Quitandinha, 15 Sep 1963 (fl), *E. Pereira 7660* (B, MO, RB).

This species comes very close to *D. riedeliana* and *D. salicifolia*, from which it can be distinguished by its narrowly ovate lamina (less than 2 cm wide) and blackened, broadly obeonical carpels with truncate apex, sparsely covered with stellate scales Table 3.

11. *D. salicifolia* R. E. Fries, Acta Horti Berg. 12(1): 48. 1934. Type. Brazil. São Paulo: Serra do Mar, Fazenda Campo Grande, 18 Nov 1892 (fl, fr), *Edwall 1988* (holotype, S; isotype, B). Figure 14

Big tree, height unknown. Young twigs densely (15-25 scales/mm2) covered with yellowish fimbriate to stellate scales, becoming glabrous with age, older twigs greyish white to dark brown, irregularly fissured. Petiole 3-5 mm long, 1-1.5 mm in diam., densely covered with yellowish fimbriate to stellate scales. Lamina narrowly elliptic, chartaceous to slightly coriaceous, green above, yellowish green below, (6-)8-11 cm long, (2-)2.5-3.4 cm wide, index (2.7-)3-3.7(-4), base attenuate, apex acuminate, upper side glabrous, slightly shiny, lower side sparsely to densely covered with yellowish fimbriate(-stellate) scales, secondary veins uniformly curved, (11-)13-16(-18) on either sides of primary vein, angles with primary veins (50°-)55°-65°(-75°), intercostal area somewhat regularly shaped, distance between the middle of closure and margin 2-5 mm, tertiary veins raised on both sides, irregularly forming 6-12 nets, 4th order veins slightly raised on both sides.

Inflorescence leaf-opposed, 1-2-flowered, subsessile, pedicel 6-10 mm long, straight, 0.6-1 mm in diam. at base, (1-)1.5-2 mm in diam. just below flower. Bracts 2 to the pedicel, one amplectant on basal 1/5-1/2 of pedicel, very broadly to depressed triangular-ovate, 0.8-1.5 mm long, 1.5-2.5 mm wide, another one broadly to very broadly triangular, 0.5-1 mm long, 0.5-1 mm wide, caducous. Pedicels and outer side of bracts densely covered with yellowish (fimbriate to) stellate scales, inner side of bracts glabrous; outer side of sepals densely covered with yellowish fimbriate to stellate scales, inner side of sepals densely covered with yellowish curviform stellate hairs (basal 1/5-1/4 sparsely covered to glabrous); outer side of petals densely covered with yellowish stellate scales, inner side densely covered with yellowish curviform stellate hairs (basal 1/6-1/5 of outer petals and 1/5-1/4 of inner petals glabrous).

Flower buds broadly to very broadly ovoid, apex acute, 6-8 mm long, 7-8 mm in diam. Sepals connate to 1/6-1/5 from base, triangular-ovate to broadly triangular-ovate, 9-11 mm long, 7-8 mm wide. Outer petals rhombic-obovate, apex apiculate to acute, 17-20 mm long, 8-11 mm wide, inner petals rhombic-obovate, apex apiculate (or acute), 16-20 mm long, 7-11 mm wide. Torus depressed ovoid. Stamens 120-200, 0.8-1.1 mm long, 0.3-0.4 mm wide, apical prolongation of connective shallowly conical, glabrous, 0.3-0.4 mm long, 0.5-0.7 mm wide. Carpels 80-120, ovary densely covered with whitish stellate scales and stellate hairs, stigma blackened, glabrous.

Fruit unknown (only loose carpels present). Fertile carpels narrowly angular-obovoid to angular-obovoid, 30-35 mm long, 10-16 mm in diam., with 5-6 ribs, top itself conical, densely covered with yellowish stellate scales, basal 2/3 of carpel fused. Seed filling up 2/3-3/4 of the carpel, ellipsoid, 18-22 mm long, 14-16 mm in diam., yellowish-brown, roughish.

Distribution (Figure 2). Only known from São Paulo in Brazil. Flowering mainly from September to December. The only record of fruiting time is in November.

Specimens examined. São Paulo: Alto da Serra, 28 Oct 1936 (fl), *Hoehne & Gehrt s.n.* (F, K, NA, NY, US, UC); Estação Biologica, Alto da Serra, 29 Sep 1922 (fl), *J. G. Kuhlmann RB19670* (RB, S); Estação Biologica, Alto da Serra, 30 Sep 1922 (fl), *J. G. Kuhlmann RB19676* (MO, RB, S); Estação Biologica, Alto da Serra, 2 Dec 1931 (fl), *Lemos SP28313* (NY, S).

This species is very similar to *D. microphylla* and *D. riedeliana*, see discussion under those species and Table 3.

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NUMERICAL LIST OF TAXA

1. *Duguetia furfuracea* (St. Hilaire) Bentham et Hooker f.
2. *Duguetia dicholepidota* Martius
3. *Duguetia moricandiana* Martius
4. *Duguetia marcgraviana* Martius
5. *Duguetia echinophora* R. E. Fries
6. *Duguetia lepidota* (Miquel) Pulle
7. *Duguetia glabriuscula* (R. E. Fries) R. E. Fries
8. *Duguetia lanceolata* A. de Saint-Hilaire
9. *Duguetia riedeliana* R. E. Fries
10. *Duguetia microphylla* (R. E. Fries) R. E. Fries
11. *Duguetia salicifolia* R. E. Fries

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Wagner, J. & Machado, B., s.n. (1).

Walter, B. M. T. et al., 210 (1).

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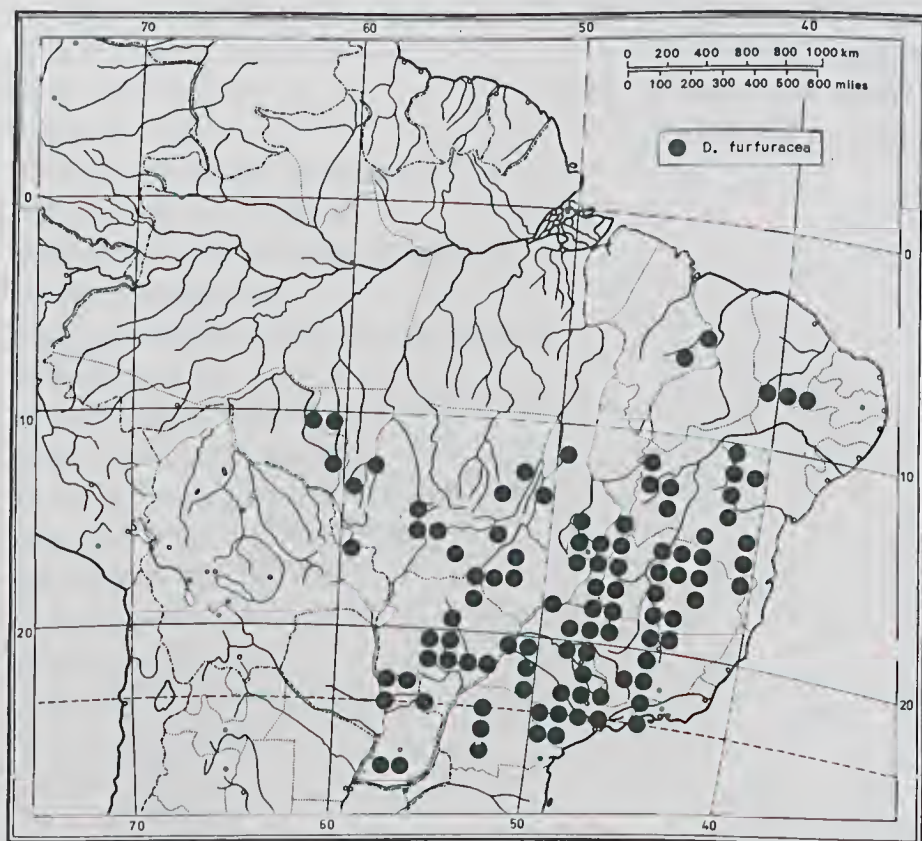
Figure 1. Distribution map of *Duguetia furfuracea*.
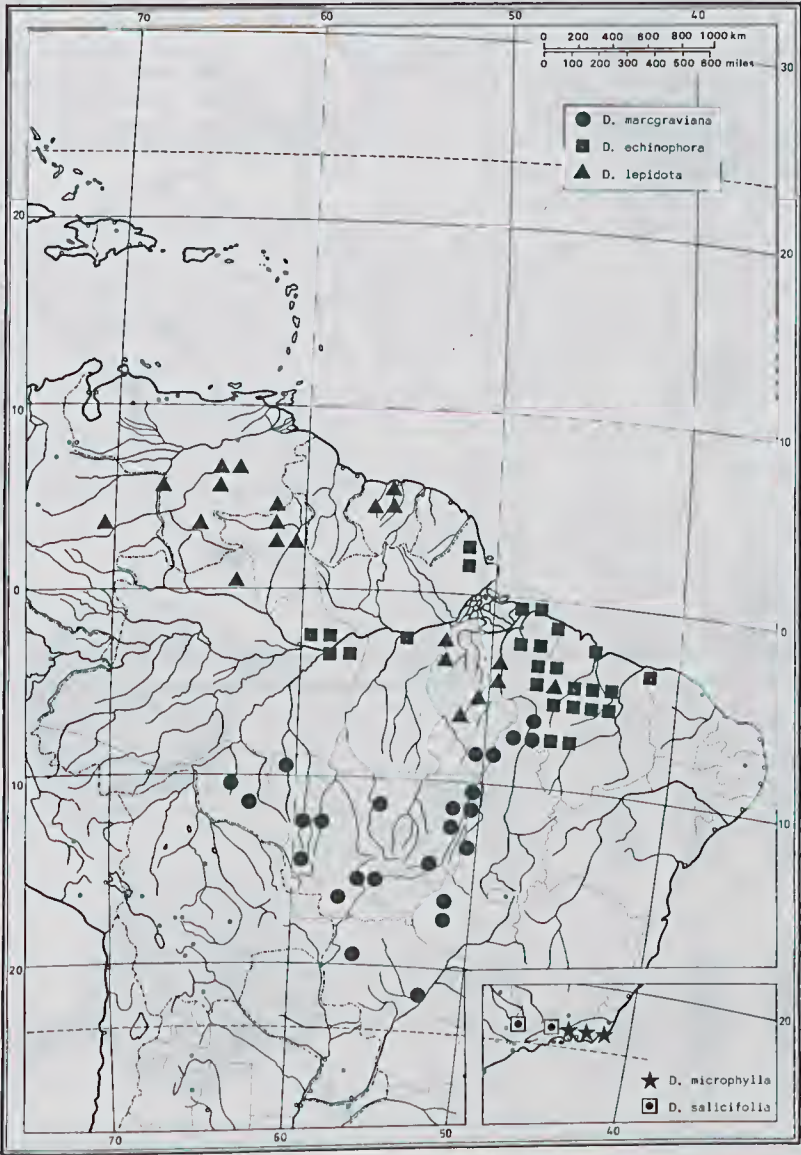
Figure 2. Distribution map of *Duguetia marcgraviana, D. echinophora, D. lepidota*; insert: *D. microphylla, D. salicifolia*.
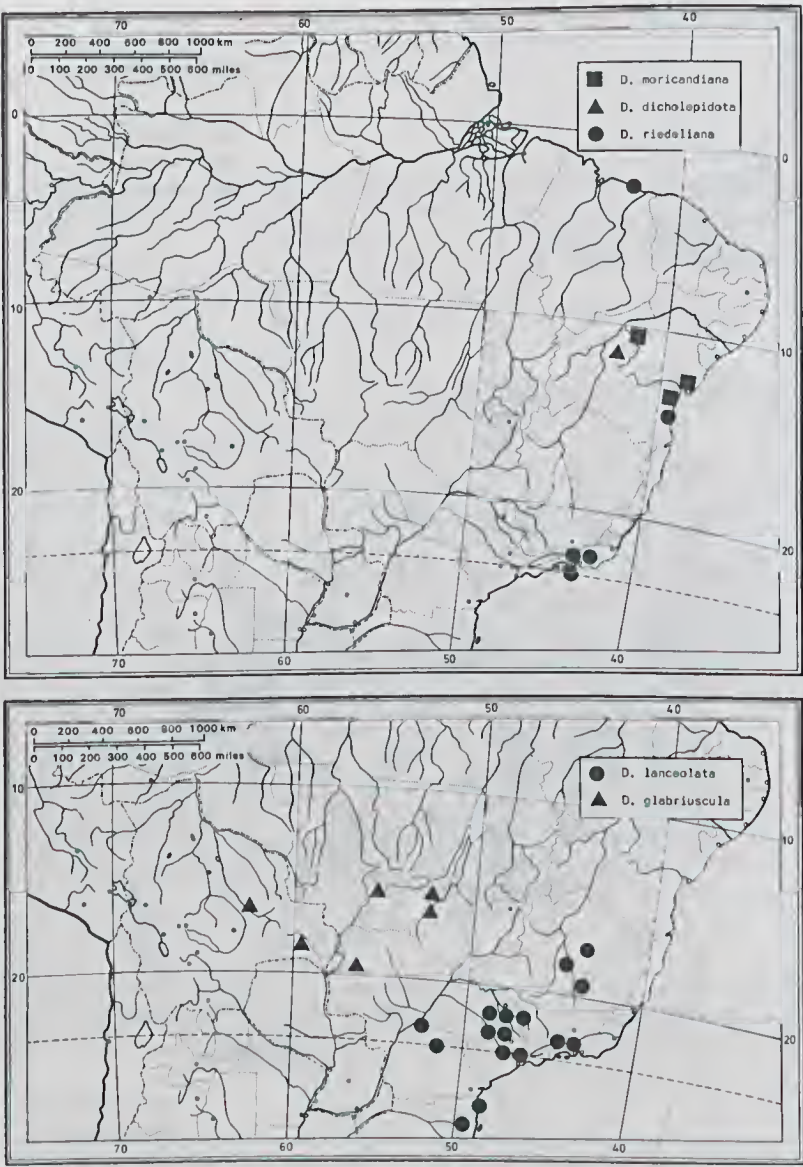
Figure 3. Distribution maps of *Duguetia moricandiana*, *D. dicholepidota*, and *D. riedeliana* (above), and *D. lanceolata* and *D. glabriuscula* (below).
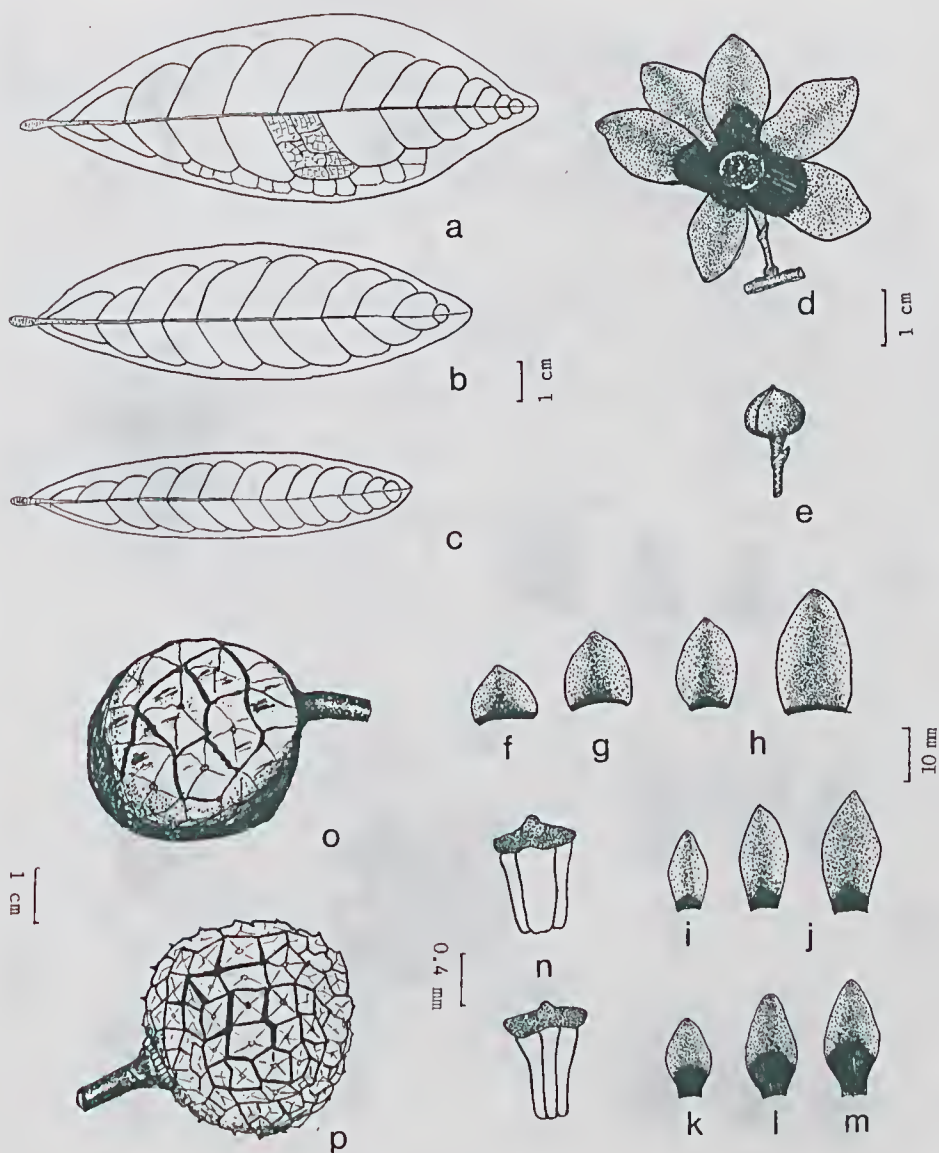
Figure 4. *Duguetia furfuracea* (A, *Brade 5882*; B, *Anderson & Hagberg 1635*; C, F, *Hemmendorff 278*; D, *Anderson et al. 8585*; G, *Brade 13473*; H, N, *Felippe 136*; I, K, *Válio 269*; L, *Malme 2006*; M, *Fernándes-Casas et al. 5969*; O, *Walter et al. 210*; P, *Bogner 1193*). A-C. Leaves. D. Flower. E. Flower bud. F-H. Sepals. I, J. Inner side of outer petals. K-M. Inner side of inner petals. N. Stamens. O, P. Fruits.